Supplementary material

Title: Which approach of THA is the best efficacy and least complication? Umbrella review of systematic reviews and meta-analyses

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Supplementary Table 4 Efficacy of interventions among total hip arthroplasty patients: Direct Meta-analysis

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Supplementary Figure 1. Funnel and contour-enhanced funnel plots for direct meta-analysis

Supplementary Figure 2 Comparison-adjusted funnel plots for network meta-analysis

Supplementary Table 1 Search terms and search strategy

PICO	Search #	Search term	Scopus 10/04/2022	Pubmed 10/04/2022
P	#1	"Total hip arthroplasty"	79,278	20,613
	#2	"Total hip replacement"	68,803	8,594
	#3	"Total hip arthroplasty" or "Total hip replacement"	108,279	27,727
I & C	#4	"Direct anterior"	3,307	889
	#5	Heuter	659	52
	#6	"Smith Peterson"	497	86
	#7	"Direct anterior" or Heuter or "Smith Peterson"	4,286	1,010
	#8	Anterolateral	31,618	12,186
	#9	"Watson Jones"	6,554	370
	#10	Anterolateral or "Watson Jones"	37,542	12,488
	#11	"Direct lateral"	3,243	496
	#12	Transgluteal	1,397	282
	#13	Hardinge	8,381	2,759
	#14	Bauer	1,643,079	35,326
	#15	"Direct lateral" or Transgluteal or Hardinge or Bauer	1,654,278	38,802

	#16	Posterior	859,203	305,527
	#17	Posterolateral	38,455	12,712
	#18	Moore	3,907,146	84,554
	#19	Southern	3,289,483	323,358
	#20	Kocher-Langenbeck	397	187
	#21	Posterior or Posterolateral or Moore or Southern or Kocher-Langenbeck	7,580,175	716,892
	#22	"2 incisions"	922	68
	#23	"two incisions"	3,083	255
	#24	"minimal invasive"	21,667	6,085
	#25	MIS	345,941	14,628
	#26	"2 incisions" or "two incisions" or "minimal invasive" or MIS	369,927	20,871
	#27	"Direct anterior" or Heuter or "Smith Peterson" or Anterolateral or "Watson Jones" or "Direct lateral" or Transgluteal or Hardinge or Bauer or Posterior or Posterolateral or Moore or Southern or Kocher-Langenbeck or "2 incisions" or "two incisions" or "minimal invasive" or MIS	9,122,449	782,949
O	#28	"Harris hip scores"	7,899	927
	#29	"Hip disabilities & Osteoarthritis Outcome Score"	10	651
	#30	"Hip disabilities and Osteoarthritis Outcome Score"	1,254	1
	#31	"Hip disabilities & Osteoarthritis Outcome Score" or "Hip disabilities and Osteoarthritis Outcome Score"	1,255	651
	#32	"Western Ontario McMasters Arthritis Index"	2	2
	#33	WOMAC	14,925	5,017

	#34	"Western Ontario McMasters Arthritis Index" or WOMAC	14,925	5,816
	#35	"Oxford Hip Scores"	1,377	95
	#36	"Visual analogue scale"	119,969	26,451
	#37	VAS	1,014,531	56,852
	#38	"Visual analogue scale" or VAS	1,088,372	68,750
	#39	"Pain score"	39,171	14,202
	#40	EQ-5D	28,631	9,386
	#41	EQ5D	1,142	7,671
	#42	"EuroQol-5 Dimension"	1,956	646
	#43	"EuroQol Questionnaire"	1,209	197
	#44	EQ-5D or EQ5D or "EuroQol-5 Dimension" or "EuroQol Questionnaire"	29,928	10,301
	#45	SF-36	89,186	21,778
	#46	SF36	5,027	22,195
	#47	"36-Item Short Form Health Survey"	34,196	3,550
	#48	"Short form-36"	38,086	10,772
	#49	SF-36 or SF36 or "36-Item Short Form Health Survey" or "Short form-36"	100,212	28,694
	#50	"Harris hip scores" or "Hip disabilities & Osteoarthritis Outcome Score" or "Hip disabilities and Osteoarthritis Outcome Score" or "Western Ontario McMasters Arthritis Index" or WOMAC or "Oxford Hip Scores" or "Visual analogue scale" or VAS or "Pain score" or EQ-5D or EQ5D or "EuroQol-5 Dimension" or "EuroQol Questionnaire" or SF-36 or SF36 or "36-Item Short Form Health Survey" or "Short form-36"	1,225,430	116,811

	#51	Time	19,851,827	4,437,465
	#52	“Blood loss”	115,541	63,665
	#53	“Hospital stay”	141,379	82,981
	#54	Hospitalization	693,919	5,687,048
	#55	“Hospital stay” or Hospitalization	776,523	5,687,048
	#56	“Intra operative fracture”	134	50
	#57	Dislocation	480,153	79,498
	#58	Infection	4,953,855	3,631,172
	#59	Complication	3,197,952	3,474,254
	#60	“Nerve injury”	127,378	21,503
	#61	Neurapraxia	1,623	457
	#62	“Harris hip scores” or “Hip disabilities & Osteoarthritis Outcome Score” or “Hip disabilities and Osteoarthritis Outcome Score” or “Western Ontario McMasters Arthritis Index” or WOMAC or “Oxford Hip Scores” or “Visual analogue scale” or VAS or “Pain score” or EQ-5D or EQ5D or “EuroQol-5 Dimension” or “EuroQol Questionnaire” or SF-36 or SF36 or "36-Item Short Form Health Survey" or “Short form-36” or Time or “Blood loss” or “Hospital stay” or Hospitalization or “Intra operative fracture” or	26,424,601	13,265,576

		Dislocation or Infection or Complication or "Nerve injury" or Neurapraxia		
PICO	#63	"Total hip arthroplasty" or "Total hip replacement" and "Direct anterior" or Heuter or "Smith Peterson" or Anterolateral or "Watson Jones" or "Direct lateral" or Transgluteal or Hardinge or Bauer or Posterior or Posterolateral or Moore or Southern or Kocher-Langenbeck or "2 incisions" or "two incisions" or "minimal invasive" or MIS and "Harris hip scores" or "Hip disabilities & Osteoarthritis Outcome Score" or "Hip disabilities and Osteoarthritis Outcome Score" or "Western Ontario McMasters Arthritis Index" or WOMAC or "Oxford Hip Scores" or "Visual analogue scale" or VAS or "Pain score" or EQ-5D or EQ5D or "EuroQol-5 Dimension" or "EuroQol Questionnaire" or SF-36 or SF36 or "36-Item Short Form Health Survey" or "Short form-36" or Time or "Blood loss" or "Hospital stay" or Hospitalization or "Intra operative fracture" or Dislocation or Infection or Complication or "Nerve injury" or Neurapraxia	2,488	2,539
	#64	"Randomized controlled trial" or "Randomized trial" or "Clinical trial"	4,327,289	1,037,574
PICO RCT	#65	"Total hip arthroplasty" or "Total hip replacement" and "Direct anterior" or Heuter or "Smith Peterson" or Anterolateral or "Watson Jones" or "Direct lateral" or Transgluteal	327	288

		or Hardinge or Bauer or Posterior or Posterolateral or Moore or Southern or Kocher-Langenbeck or "2 incisions" or "two incisions" or "minimal invasive" or MIS and "Harris hip scores" or "Hip disabilities & Osteoarthritis Outcome Score" or "Hip disabilities and Osteoarthritis Outcome Score" or "Western Ontario McMasters Arthritis Index" or WOMAC or "Oxford Hip Scores" or "Visual analogue scale" or VAS or "Pain score" or EQ-5D or EQ5D or "EuroQol-5 Dimension" or "EuroQol Questionnaire" or SF-36 or SF36 or "36-Item Short Form Health Survey" or "Short form-36" or Time or "Blood loss" or "Hospital stay" or Hospitalization or "Intra operative fracture" or Dislocation or Infection or Complication or "Nerve injury" or Neurapraxia and "Randomized controlled trial" or "Randomized trial" or "Clinical trial"		
PICO RCT Filter from last search 2019	#65	"Total hip arthroplasty" or "Total hip replacement" and "Direct anterior" or Heuter or "Smith Peterson" or Anterolateral or "Watson Jones" or "Direct lateral" or Transgluteal or Hardinge or Bauer or Posterior or Posterolateral or Moore or Southern or Kocher-Langenbeck or "2 incisions" or "two incisions" or "minimal invasive" or MIS and "Harris hip scores" or "Hip disabilities & Osteoarthritis Outcome Score" or "Hip disabilities and Osteoarthritis Outcome Score" or	101	85

		"Western Ontario McMasters Arthritis Index" or WOMAC or "Oxford Hip Scores" or "Visual analogue scale" or VAS or "Pain score" or EQ-5D or EQ5D or "EuroQol-5 Dimension" or "EuroQol Questionnaire" or SF-36 or SF36 or "36-Item Short Form Health Survey" or "Short form-36" or Time or "Blood loss" or "Hospital stay" or Hospitalization or "Intra operative fracture" or Dislocation or Infection or Complication or "Nerve injury" or Neurapraxia and "Randomized controlled trial" or "Randomized trial" or "Clinical trial"		
PICO SR & MA or NMA		"Total hip arthroplasty" or "Total hip replacement" and "Direct anterior" or Heuter or "Smith Peterson" or Anterolateral or "Watson Jones" or "Direct lateral" or Transgluteal or Hardinge or Bauer or Posterior or Posterolateral or Moore or Southern or Kocher-Langenbeck or "2 incisions" or "two incisions" or "minimal invasive" or MIS and "Harris hip scores" or "Hip disabilities & Osteoarthritis Outcome Score" or "Hip disabilities and Osteoarthritis Outcome Score" or "Western Ontario McMasters Arthritis Index" or WOMAC or "Oxford Hip Scores" or "Visual analogue scale" or VAS or "Pain score" or EQ-5D or EQ5D or "EuroQol-5 Dimension" or "EuroQol Questionnaire" or SF-36 or SF36 or "36-Item Short Form Health Survey" or "Short form-36" or Time	89	79

		or “Blood loss” or “Hospital stay” or Hospitalization or “Intra operative fracture” or Dislocation or Infection or Complication or “Nerve injury” or Neurapraxia and "meta analysis" or "Network meta-analysis" or "systematic review"		

Supplementary Table 2 Citation Matrix: Individual randomized controlled trial included in systematic review/meta-analysis

Author	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total
Barrett WP	2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Brisma B	2018	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2
Cheng TE	2017	1	0	1	1	1	1	1	0	0	0	0	1	1	1	0	0	1	1	1	0	0	0	0	0	1	0	13
Christensen CP	2015	1	0	1	1	1	1	1	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	1	1	0	0	12
Anta-Diaz BD	2016	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	4
Della Valle CJ	2010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dienstknecht T	2014	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3
Goosen JHM	2011	1	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	6
Ji HM	2012	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Martin R	2011	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	4
Mayr E	2009	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Meng W	2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	5
Mjaaland KE	2015	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	8
Moerenhout K	2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Nistor DV	2017	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	4
Ouyang C	2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Parvizi J	2016	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
Pospischill M	2010	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Reichert J	2018	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1	0	0	6
Restrepo C	2010	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	5
Rosenlund S	2017	0	0	0	0	0	0	0	0	1	1	1	0	0		0	0	0	0	1	0	0	0	0	0	0	0	4
Rykov K	2017	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	1	0	10
Takada R	2018	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Taunton MJ	2014	1	0	1	1	1	1	1	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	12
Witzleb WC	2009	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	3
Xie J	2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	6
Xu J	2017	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Yang C	2010	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
Zhao HY	2017	0	0	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	0	18
Zomar BO	2018	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	5
Jia F	2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Vicente JR	2014	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Landgraeber S	2013	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Barrett WP	2013	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	22
Bon G	2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Meng W	2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Taunton MJ	2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Yan T	2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Yuan H	2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Dongwei R	2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total		13	1	5	5	5	15	4	4	13	9	7	5	15	6	4	3	6	4	18	3	2	6	9	9	12	6	189

1.Putananon C (2018) 2.Higgins BT (2015) 3.Miller LE (2018) 4.Wang Z (2018) 5.Miller LE (2018) 6.Kucukdurmaz F (2019) 7.Jia F (2018) 8.Wang Z (2019) 9.Migliorini F (2021) 10.Migliorini F (2020) 11.Cha Y (2020) 12.Peng L (2020) 13.Docter S (2020) 14.Yang XT (2020) 15.Chen W (2020) 16.Sun X (2021) 17. Awad ME (2021) 18. Huerfano E (2021) 19. Gazendam A (2021)

20.Ge Y (2021) 21. Joseph VM (2022) 22. Lazaru P (2021) 23.Ramadanov N (2021) 24. Ramadanov N (2021) 25. Ramadanov N (2022) 26. Ramadanov N (2022) 27. Zhou Z (2022) 28. Ang J (2023)

Supplementary Table 3 Methodological quality assessment of included systematic review/meta-analysis using ROBIS

A) Assessing relevance (phase I)

Author	Year	Patient	Intervention	Comparator	Outcome	Summarized quality	Rationale
Putananon C [37]	2018	High	Low	Low	Low	High	No Definite diagnosis
Higgins BT[6]	2015	Low	Low	Low	Low	High	No concern
Miller LE[34]	2018	Low	Low	Low	Low	High	No concern
Wang Z[44]	2018	High	Low	Low	Low	High	No Definite diagnosis
Miller LE[35]	2018	Low	Low	Low	Low	High	No concern
Kucukdurmaz F[30]	2019	High	Low	Low	Low	High	No Definite diagnosis
Jia F[28]	2018	High	Low	Low	Low	Low	No Definite diagnosis
Wang Z[43]	2019	Low	Low	Low	Low	High	No concern
Migliorini F[32]	2021	Low	Low	Low	Low	Low	No concern
Migliorini F[33]	2020	Low	Low	Low	Low	Low	No concern

Cha Y[22]	2020	High	Low	Low	Low	Low	No Definite diagnosis
Peng L[36]	2020	High	Low	Low	Low	Low	No Definite diagnosis
Docter S[24]	2020	Low	Low	Low	Low	High	No concern
Yang XT[45]	2020	High	Low	Low	Low	Low	No Definite diagnosis
Chen W[23]	2020	High	Low	Low	Low	Low	No Definite diagnosis
Sun X[42]	2021	High	Low	Low	Low	Low	No Definite diagnosis
Awad ME [21]	2021	Low	Low	Low	Low	High	No concern
Huerfano E [27]	2021	High	Low	Low	Low	Low	No Definite diagnosis
Gazendam A [25]	2021	Low	Low	Low	Low	High	No concern
Ge Y [26]	2021	Low	Low	Low	Low	High	No concern
Joseph VM [29]	2022	Low	Low	Low	Low	High	No concern

Lazaru P [31]	2021	Low	Low	Low	Low	High	No concern
Ramadanov N [39]	2021	Low	Low	Low	Low	High	No concern
Ramadanov N [40]	2021	Low	Low	Low	Low	High	No concern
Ramadanov N [41]	2022	Low	Low	Low	Low	High	No concern
Ramadanov N [38]	2022	Low	Low	Low	Low	High	No concern
Zhou Z [46]	2022	High	Low	Low	Low	Low	No Definite diagnosis
Ang J [20]	2023	High	Low	Low	Low	Low	No Definite diagnosis

If the answers to all signaling questions for a domain were "yes" or "probably yes," then level of concern could be judged as low. If any signaling question was answered "no" or "probably no," there was potential for concern about high bias.

B) Judging risk of bias

Author	Year	Phase II				Phase III	Rationale
		Domain 1 (Study eligibility criteria)	Domain2 (Identification and selection of studies)	Domain 3 (Data collection and study appraisal)	Domain 4 (Synthesis and findings)	Risk of bias in the review	
Putananon [37]	2018	Low	Low	Low	Low	Low	No concern
Higgins BT [6]	2015	Low	Low	Low	Low	High	5. No information of sensitivity analyses, and publication bias
Miller LE [34]	2018	Low	Low	Low	Low	Low	No concern
Wang Z [44]	2018	Low	Low	Low	Low	Low	No concern
Miller LE [35]	2018	Low	Low	Low	Low	High	5. No information of sensitivity analyses, and publication bias
Kucukdurmaz F [30]	2019	Low	Low	Low	Low	Low	No concern

Jia F [28]	2018	Low	Low	Low	Low	High	5. No information of sensitivity analyses, and publication bias
Wang Z [43]	2019	Low	Low	Low	Low	Low	No concern
Migliorini F [32]	2021	High	Low	High	Low	Low	1.Do not give the general detail of inclusion study 3.Do not show information of risk of bias assessment
Migliorini F [33]	2020	High	Low	High	Low	Low	1.Do not give the general detail of inclusion study 3.Do not show information of risk of bias assessment
Cha Y [22]	2020	High	Low	Low	Low	High	1.Do not give the general

							detail of inclusion study 5. No information of sensitivity analyses, and publication bias
Peng L [36]	2020	Low	Low	Low	Low	High	5. No information of sensitivity analyses, and publication bias
Docter S [24]	2020	Low	Low	Low	Low	Low	No concern
Yang XT [45]	2020	Low	High	Low	Low	Low	2. Insufficient definition of collected variables
Chen W [23]	2020	Low	High	Low	Low	Low	2. Insufficient definition of collected variables
Sun X [42]	2021	High	High	High	Low	Low	1. Restriction included studies (language)

							2. Insufficient definition of collected variables 3.Do not show information of risk of bias assessment
Awad ME [21]	2021	Low	Low	Low	Low	Low	No concern
Huerfano E [27]	2021	Low	Low	Low	Low	Low	No concern
Gazendam A[25]	2021	Low	Low	Low	Low	Low	No concern
Ge Y [26]	2021	Low	Low	Low	Low	Low	No concern
Joseph VM [29]	2022	Low	Low	Low	Low	Low	No concern
Lazaru P [31]	2021	Low	Low	Low	Low	Low	No concern
Ramadanov N [39]	2021	Low	Low	Low	Low	Low	No concern
Ramadanov N [40]	2021	Low	Low	Low	Low	Low	No concern
Ramadanov N [41]	2022	Low	Low	Low	Low	Low	No concern
Ramadanov N [38]	2022	Low	Low	Low	Low	Low	No concern
Zhou Z [46]	2022	Low	Low	Low	Low	Low	No concern
Ang J [20]	2023	Low	Low	Low	Low	High	5. No information

							of sensitivity analyses, and publication bias

If the answers to all signalling questions for a domain were "yes" or "probably yes," then level of concern could be judged as low. If any signalling question was answered "no" or "probably no," there was potential for concern about high bias.

Supplementary Table 4 Efficacy of interventions among total hip arthroplasty patients: Direct Meta-analysis

A) Efficacy of Interventions on Harris Hip Score (HHS)

HHS ≤ 3 months							
Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			PA			
Barrett WP (2013) [53]	43	91.20	9.70	44	91.40	9.70	-0.20 (-4.28, 3.88)
Taunton MJ (2014) [87]	27	95.50	0.83	27	93.25	2.10	2.25 (1.40, 3.10)
Lou Z (2016) [69]	52	83.60	7.10	52	79.80	6.60	3.80 (1.17, 6.43)
Zhao HY (2017) [96]	60	85.90	17.36	60	79.60	11.87	6.30 (0.98, 11.62)
Rykov K (2017) [85]	23	93.00	10.87	23	90.00	9.14	3.00 (-2.80, 8.80)
Xu J (2017) [94]	45	85.50	4.10	42	79.00	4.40	6.50 (4.71, 8.29)
Taunton MJ (2018) [88]	28	88.4	11.8	27	83.3	15.1	5.10 (-2.05, 12.25)
Moerenhout K (2019) [75]	28	88.4	11.8	27	83.3	15.1	5.10 (-2.05, 12.25)
Bon G (2019) [54]	50	89.95	12.73	50	91.30	9.48	-1.35 (-5.75, 3.05)
Cao J (2020) [56]	65	91.6	1.1	65	91.3	1.3	0.30 (-0.11, 0.71)
Pool mean difference							2.79 (1.03, 4.55)
	LA			PA			
Witzleb WC (2009) [92]	30	75.25	3.10	30	80.75	4.69	-5.50(-7.51, -3.49)
Meneghimi RM (2009) [72]	8	89.40	18.15	8	90.00	18.27	-0.60(-18.45, 17.25)
Yang C (2010) [95]	55	83.8	5.64	55	74.96	7.47	8.84(6.37, 11.31)
Goosen JHM (2011) [63]	30	75.00	15.00	30	70.00	15.00	5.00(-2.86, 12.86)
Pool mean difference							2.15 (-7.92, 12.23)
	DAA			LA			
Restrepo C (2010) [82]	50	91.10	5.53	50	85.58	13.37	5.52(1.51, 9.53)
Dienstknecht T (2014) [61]	55	78.00	12.70	88	74.10	13.60	1.90(-3.33, 7.13)
Anta-Díaz BD (2016) [59]	49	94.60	10.20	50	92.80	11.30	1.80(-2.44, 6.04)

Brisma B (2018) [55]	50	82.10	3.16	50	74.74	3.69	7.36(6.01, 8.71)
Reichert J (2018) [81]	77	89.80	9.30	71	88.40	9.90	1.40(-1.70, 4.50)
Zomar BO (2018)[97]	36	95.44	1.25	42	92.04	1.12	3.40 (2.87, 3.93)
Li SL (2019) [67]	25	88.7	10.8	25	86.5	10.2	2.20 (-3.62, 8.02)
Pool mean difference							3.76 (1.67, 5.85)
	2incision			PA			
Meneghimi RM (2009) [72]	8	92.90	18.86	8	90.00	18.27	2.90(-15.30, 21.10)
Della Valle CJ (2010) [60]	37	85.00	11.00	35	85.00	11.00	0.00(-5.08, 5.08)
Pool mean difference							0.21(-4.69, 5.11)
	DSA/SuperPath			PA			
Xie J (2017) [93]	46	87.6	1.76	46	80.1	4.49	7.50 (6.11, 8.89)
Hongmou Y (2018)	40	86.53	1.15	44	86.14	0.77	0.39 (-0.03, 0.81)
Ouyang C (2018) [78]	12	82.08	4.76	12	79.25	5.99	2.83 (-1.50, 7.16)
Meng W (2019) [73]	4	72.25	3.86	4	83.25	2.36	-11.00 (-15.43, -6.57)
Meng W (2021) [19]	20	82.44	3.51	20	82.38	2.68	0.06 (-1.88, 2.00)
Li X (2021) [68]	49	84	11.93	47	73.45	10.64	10.55 (6.02, 15.08)
Pool mean difference							2.06 (-3.74, 7.86)
HHS at 6 months							
Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			PA			
Barrett WP (2013) [53]	43	95.80	7.80	44	95.90	6.80	-0.10 (-3.18, 2.98)
Zhao HY (2017) [96]	60	92.20	13.25	60	89.90	11.74	2.30 (-2.18, 6.78)
Xu J (2017) [94]	45	94.30	2.70	42	95.20	1.90	-0.90 (-1.88, 0.08)
Taunton MJ (2018) [88]	28	90.1	11.3	27	90.3	12.3	-0.20 (-6.44, 6.04)
Moerenhout K (2019) [75]	28	90.1	11.3	27	90.3	12.3	-0.20 (-6.44, 6.04)
Cao J (2020) [56]	65	93	1.5	65	92.9	1.4	0.10 (-0.40, 0.60)
Pool mean difference							-0.08 (-0.52, 0.36)

	LA			PA			
Meneghimi RM (2009) [72]	8	95.80	19.45	8	87.30	17.72	8.50 (-9.73, 26.73)
Ji HM (2012) [65]	97	92.30	5.50	99	91.0	6.70	1.30 (-0.41, 3.01)
Pool mean difference							1.36 (-0.34, 3.07)
	DAA			LA			
Restrepo C (2010) [82]	50	91.50	5.47	50	86.19	12.71	5.31 (1.47, 9.15)
Reichert J (2018) [81]	77	90.30	9.80	71	89.10	10.00	1.20 (-1.99, 4.39)
Senlei (2019) [67]	25	93.5	11.6	25	90.9	11.1	2.60 (-3.69, 8.89)
Pool mean difference							2.84 (0.56, 5.13)
	DSA/SuperPath			PA			
Ouyang C (2018) [78]	12	84.92	5.87	12	84.17	7.04	0.75 (-4.44, 5.94)
Hongmou Y (2018) [64]	40	90.00	2.03	44	89.34	2.29	0.66 (-0.27, 1.59)
Meng W (2019) [73]	4	84.25	6.18	4	86.75	3.86	-2.50 (-9.64, 4.64)
Meng W (2021) [19]	20	87.27	3.47	20	87.55	3.56	0.22 (-1.96, 2.40)
Li X (2021) [68]	49	87.27	12.4	47	86.55	12.55	0.72 (-4.27, 5.71)
Pool mean difference							0.18 (-1.63, 1.98)
HHS at 1 year							
Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			PA			
Barrett WP (2013) [53]	43	97.50	5.70	44	97.30	5.50	0.20(-2.15, 2.55)
Taunton MJ (2014) [87]	27	97.50	0.42	27	95.50	1.85	2.00(1.28, 2.72)
Taunton MJ (2018) [88]	28	94.4	8	27	91.4	13	3.00 (-2.68, 8.68)
Moerenhout K (2019) [75]	28	94.4	8	27	91.4	13	3.00 (-2.68, 8.68)
Rykov K (2021) [84]	23	98.1	2.8	23	97.4	4.5	0.70 (-1.47, 2.87)
Pool mean difference							1.78 (1.13, 2.42)
	LA			PA			

Meneghimi RM (2009) [72]	8	95.40	19.37	8	95.50	19.39	-0.10(-19.09,18.89)
Goosen JHM (2011) [63]	30	90.00	10.00	30	90.00	10.00	0.00(-5.24, 5.24)
Pool mean difference							-0.01(-5.06, 5.05)
	DAA			LA			
Restrepo C (2010) [82]	50	91.64	5.50	50	90.32	6.27	1.32(-0.99, 3.63)
Anta-Díaz BD (2016) [59]	49	96.2	10.1	50	94.5	9.7	1.70 (-2.20, 5.60)
Brisma B (2018) [55]	50	90.53	3.16	50	89.47	3.16	1.06(-0.18, 2.30)31.0
Reichert J (2018) [81]	77	91.40	9.10	71	92.40	8.60	1.00(-1.86, 3.86)
Pool mean difference							1.14 (0.15, 2.13)
	2-incision			PA			
Meneghimi RM (2009)[72]	8	95.10	19.30	8	95.50	19.39	-0.40(-19.36,18.56)
Della Valle CJ (2010)[60]	37	89.00	8.00	35	91.00	5.00	-2.00(-5.06, 1.06)
Pool mean difference							-1.96(-4.98, 1.07)
	DSA/SuperPath			PA			
Xie J (2017) [93]	46	92.3	1.62	46	91.6	2.41	0.70 (-0.14, 1.54)
Ouyang C (2018) [78]	12	85.58	6.54	12	86.75	3.14	-1.17 (-5.27, 2.93)
Meng W (2019) [73]	4	92.5	1.73	4	92.5	1.73	0.00 (-2.40, 2.40)
Meng W (2021) [19]	20	88	12.5	20	89.45	12.97	-0.05 (-1.77, 1.67)
Li X (2021) [68]	49	88	12.5	47	89.45	12.97	-1.45 (-6.54, 3.64)
Pool mean difference							0.42 (-0.28, 1.12)

HHS = Harris hip score, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

B) Efficacy of interventions on dislocation

Author (Year)	No. patient	No. event	No. patient	No. event	RR (95%CI)
	DAA		PA		
Barrett WP (2013)[53]	43	0	44	1	0.34(0.01, 8.14)
Cheng TE (2017) [57]	35	1	37	1	1.06(0.07, 16.26)
Taunton MJ (2018)[88]	52	1	49	1	0.94 (0.06, 14.65)
Bon G (2019)[54]	50	1	50	0	3.00(0.13, 71.89)
Cao J (2020)[56]	65	0	65	2	0.20 (0.01, 4.09)
Rykov K (2021) [84]	23	10	23	11	0.91 (0.48, 1.71)
Pooled RR					0.87 (0.49, 1.55)
	LA		PA		
Witzleb WC (2009)[92]	30	0	30	1	0.33(0.01, 7.86)
Yang C (2010)[95]	55	0	55	0	1.00(0.02, 49.51)
Ji HM (2012)[65]	97	3	99	0	7.14(0.37, 136.49)
Vicente JR (2014)[90]	121	1	103	0	2.56 (0.11, 62.11)
Rosenlund S (2017)[83]	38	0	39	1	0.34(0.01, 8.14)
Wang T (2019)[91]	32	0	32	0	1.00 (0.02, 48.92)
Pooled RR					1.20 (0.31, 4.67)
	DAA		LA		
Nistor DV (2017)[77]	35	0	35	0	1.00(0.02, 49.00)
Takada R (2018)[86]	30	0	30	0	1.00(0.02, 48.77)
Brisma B (2018)[55]	50	2	50	0	5.00(0.25, 101.53)
Reichert J (2018)[81]	77	0	71	1	0.31(0.01, 7.42)
Pooled RR					1.20(0.22, 6.63)
	DSA/SuperPath		PA		
Xie J (2017)[93]	46	1	46	0	3.00 (0.13, 71.78)
Meng W (2019)[73]	4	0	4	0	1.00 (0.02, 41.21)

Meng W (2021)[19]	20	0	20	0	1.00 (0.02, 48.09)
Li X (2021)[68]	49	0	47	2	0.19 (0.01, 3.90)
Ulivi M (2021)[18]	22	2	23	0	5.22 (0.26, 102.93)
Pooled RR					1.28 (0.29, 5.57)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip, RR = risk ratio

C) Efficacy of interventions on intra-operative fracture

Author (Year)	No. patient	No. event	No. patient	No. event	RR (95%CI)
	DAA		PA		
Barrett WP (2013)[53]	43	0	44	1	0.34(0.01, 8.14)
Cheng TE (2017) [57]	35	3	37	0	3.17(0.13, 75.28)
Zhao HY (2017)[96]	60	1	60	0	3.00(0.12, 72.18)
Taunton MJ (2018)[88]	52	0	49	2	0.19 (0.01, 3.83)
Bon G (2019)[54]	50	0	50	0	1.00(0.02, 49.42)
Moerenhout K (2019)[75]	28	0	27	2	0.19 (0.01, 3.85)
Cao J (2020)[56]	65	0	65	1	0.33 (0.01, 8.03)
Pooled RR					0.59 (0.18, 1.98)
	LA		PA		
Witzleb WC (2009)[92]	30	1	30	1	1.00(0.07, 15.26)
Meneghimi RM (2009)[72]	8	0	8	0	1.00(0.02, 44.50)
Yang C (2010)[95]	55	0	55	0	1.00(0.02, 49.51)
Goosen JHM (2011)[63]	30	2	30	0	5.00(0.25, 99.82)
Ji HM (2012)[65]	97	3	99	0	7.14(0.37,136.49)
Vicente JR (2014)[90]	121	2	103	1	1.70 (0.16, 18.51)
Pooled RR					2.10 (0.62, 7.13)
	DAA		LA		
Restrepo C (2010)[82]	50	0	50	0	1.00(0.02, 49.42)
Dienstknecht T (2014) [61]	55	1	88	3	0.53(0.06, 5.00)
Nistor DV (2017)[77]	35	1	35	0	3.00(0.13, 71.15)
Takada R (2018)[86]	30	0	30	0	1.00(0.02, 48.77)
Zomar BO (2018)[97]	36	1	42	0	3.49 (0.15, 83.03)
Nistor DV (2020)[76]	56	1	56	1	1.00 (0.06, 15.59)
Pooled RR					1.18 (0.34, 4.02)
	2-incision		PA		
Meneghimi RM (2009)[72]	8	0	8	0	1.00(0.02, 44.50)

	Della valle CJ (2010)[60]	37	1	35	0	2.84(0.12, 67.36)
PA	Pooled RR					1.85(0.16, 21.04)
		DSA/SuperPath		PA		
	Xie J (2017)[93]	46	0	46	0	1.00 (0.02, 49.35)
	Ouyang C (2018)[78]	12	1	12	0	3.00 (0.13, 67.06)
	Meng W (2019)[73]	4	0	4	0	1.00 (0.02, 41.21)
	Meng W (2021)[19]	20	0	20	0	1.00 (0.02, 48.09)
	Ulivi M (2021)[18]	22	1	23	0	3.13 (0.13, 72.99)
	Pooled RR					1.75 (0.37, 8.35)
		LMIS		LA		
	Pospischill M (2010)[80]	36	1	39	0	1.00 (0.02, 48.09)
	Martin R (2011)[70]	42	0	41	0	0.98 (0.02, 48.10)
	Landgraeber S (2013)[66]	20	0	20	0	3.24 (0.14, 77.15)
	Pooled RR					1.65 (0.21, 13.12)

Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip, RR = risk ratio

D) Efficacy of interventions on operative time (minute)

Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			PA			
Barrett WP (2013)[53]	43	84.30	12.40	44	60.50	12.40	23.80(18.59, 29.01)
Lou Z (2016) [69]	52	57.60	9.40	52	54.40	8.20	3.20(-0.19, 6.59)
Cheng TE (2017) [57]	35	124.75	14.10	37	101.50	14.83	23.25(16.57, 29.93)
Zhao HY (2017)[96]	60	83.26	6.69	60	65.48	13.32	17.78(14.01, 21.55)
Rykov K (2017)[85]	23	71.00	7.00	23	62.00	7.00	9.00(4.95, 13.05)
Xu J (2017)[94]	45	74.30	10.10	42	37.50	4.30	36.80(33.58, 40.02)
Bon G (2019)[54]	50	70.10	11.00	50	56.70	11.79	13.40(8.93, 17.87)
Moerenhout K (2019)[75]	28	59.9	12.7	27	45.7	17.9	14.20 (6.02, 22.38)
Cao J (2020)[56]	65	88	4.5	65	66.8	4.5	21.20 (19.65, 22.75)
Rykov K (2021) [84]	23	71	7	23	62	7	9.00 (4.95, 13.05)
Pooled mean difference							17.17 (10.91, 23.42)
	LA			PA			
Witzleb WC (2009)[92]	30	67.00	33.33	30	79.25	70.21	-12.25(-40.06, 15.56)
Yang C (2010)[95]	55	77.55	13.39	55	79.25	70.21	3.88(-1.34, 9.10)
Ji HM (2012)[65]	97	132.00	37.50	99	105.00	25.70	27.00(17.98, 36.02)
Wang T (2019)[91]	32	97.14	10.52	32	95.77	11.22	1.37 (-3.96, 6.70)
Pooled mean difference							7.56 (-4.29, 19.41)
	DAA			LA			
Mayr E (2009)[71]	16	71.25	19.27	17	72.25	31.77	-1.00(-18.81, 16.81)
Restrepo C (2010)[82]	50	59.46	97.05	50	61.44	184.00	-1.98(-59.64, 55.68)
Dienstknecht T (2014) [61]	55	60.00	13.90	88	68.00	26.80	-8.00(-14.70, -1.30)

Mjaaland KE (2015)[74]	84	85.50	314.17	80	65.25	68.85	20.25(-48.61, 89.11)
Anta-Díaz BD (2016) [59]	49	78.20	16.20	50	82.20	15.20	-4.00(-10.19, 2.19)
Parvizi J (2016) [79]	44	101.26	934.99	40	117.27	2257.48	-16.01(-768.17,736.15)
Nistor DV (2017)[77]	35	71.25	2.60	35	68.75	2.60	2.50(17.77, 23.73)
Takada R (2018)[86]	30	75.20	13.90	30	77.30	13.90	-2.10(-9.13, 4.93)
Brismar B (2018) [55]	50	100.00	10.27	50	79.25	3.19	20.75(17.77, 23.73)
Li SL (2019)[67]	25	108.33	18.5	25	103.26	15.5	5.07 (-4.39, 14.53)
Pooled mean difference							2.43 (-5.80, 10.67)
	DSA/SuperPath			PA			
Xie J (2017)[93]	46	103.6	11.8	46	106.5	16.5	-2.90 (-8.76, 2.96)
Hongmou Y (2018) [64]	40	57.5	5.66	44	63.64	6.5	-6.14 (-8.76, -3.52)
Ouyang C (2018)[78]	12	109.6	28.3	12	67.5	16.2	42.10 (23.65, 60.55)
Meng W (2019)[73]	4	103.25	12.41	4	66.5	13.79	36.75 (18.57, 54.93)
Meng W (2021)[19]	20	102.72	13.55	20	66.22	11.59	36.50 (28.69, 44.31)
Li X (2021)[68]	49	83.16	7.42	47	63.77	9.13	19.39 (16.07, 22.71)
Ulivi M (2021)[18]	22	90	14	23	77	20	13.00 (2.87, 23.13)
Pooled mean difference							18.55 (4.84, 32.27)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

E) Efficacy of interventions on length of hospital stay (day)

Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
		DAA			PA		
Barrett WP (2013)[53]	43	2.28	0.87	44	3.02	1.08	-0.74(-1.15, -0.33)
Christensen CP (2015)[58]	28	1.40	0.60	23	2.00	1.10	-0.60(-1.07, -0.13)
Cheng TE (2017) [57]	35	4.09	0.14	37	4.85	1.34	-0.76(-1.21, -0.31)
Zhao HY (2017)[96]	60	2.80	0.16	60	3.30	0.37	-0.50(-0.60, -0.40)
Rykov K (2017)[85]	23	1.50	2.70	23	1.50	0.70	0.00(-1.14, 1.14)
Taunton MJ (2018)[88]	52	2.38	0.63	49	2.46	0.79	-0.08 (-0.36, 0.20)
Bon G (2019)[54]	50	2.84	1.25	50	2.80	1.78	0.04(-0.56, 0.64)
Moerenhout K (2019)[75]	28	3.8	1.8	27	3.5	2.2	0.30 (-0.76, 1.36)
Cao J (2020)[56]	65	4.2	1	65	4.7	0.7	-0.50 (-0.80, -0.20)
Rykov K (2021)[84]	23	1	1	23	1	1	0.00 (-0.58, 0.58)
Pool mean difference							-0.39 (-0.57, -0.21)
		DAA			LA		
Restrepo C (2010)[82]	50	4.03	0.57	50	4.25	1.88	-0.22(-0.76, 0.32)
Dienstknecht T (2014) [61]	55	8.80	1.50	88	9.00	1.70	-0.20(-0.73, 0.33)
Parvizi J (2016) [79]	44	1.52	0.28	40	1.61	0.23	-0.09(-0.20, 0.02)
Zomar BO (2018)[97]	36	0.80	0.20	42	2.20	0.24	-1.40(-1.50, -1.30)
Brisma B (2018)[55]	50	3.25	0.10	50	4.00	0.08	-0.75(-0.79, -0.71)
Pool mean difference							-0.57 (-1.02, -0.11)
		2-incision			PA		
Meneghimi RM (2009)[72]	8	1.50	0.18	8	1.60	0.20	-0.10(-0.29, 0.09)
Della valle CJ (2010)[60]	37	1.96	0.83	35	2.13	1.04	-0.17(-0.61, 0.27)
Pool mean difference							-0.11(-0.28, 0.06)
		DSA/SuperPath			PA		
Xie J (2017)[93]	46	8.30	3.60	46	11.4	2.40	-3.10 (-4.35, -1.85)
Ouyang C (2018)[78]	12	3.80	0.70	12	3.70	0.80	0.10 (-0.50, 0.70)

Meng W (2019)[73]	4	3.25	0.50	4	2.75	0.50	0.50 (-0.19, 1.19)
Meng W (2021)[19]	20	3.00	0.10	20	2.72	0.57	0.28 (0.03, 0.53)
Li X (2021)[68]	49	5.73	1.42	47	10.08	3.33	-4.35 (-5.37, -3.33)
Pool mean difference							-1.23 (-2.64, 0.18)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

F) Efficacy of interventions on incision length (cm)

Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			PA			
Barrett WP (2013)[53]	43	13.70	0.90	44	12.70	1.30	1.00(0.53, 1.47)
Cheng TE (2017)[57]	35	10.50	1.48	37	13.80	3.63	-3.30(-4.57, -2.03)
Zhao HY (2017)[96]	60	9.09	0.45	60	13.14	0.31	-4.05(-4.19, -3.91)
Xu J (2017)[94]	45	9.20	0.70	42	9.50	0.60	-0.30(-0.57, -0.03)
Cao J (2020)[56]	65	9.1	0.6	65	13.5	0.9	-4.40 (-4.66, -4.14)
Pool mean difference							-2.20 (-4.21, -0.19)
	DAA			LA			
Restrepo C (2010)[82]	50	10.30	0.32	50	10.54	0.49	-0.24(-0.40, -0.08)
Dienstknecht T (2014) [61]	55	9.30	1.40	88	13.40	2.70	-4.10(-4.77, -3.43)
Anta-Diaz BD (2016)	49	10.40	0.90	50	11.50	0.70	-1.10(-1.42, -0.78)
Nistor DV (2017)[77]	35	12.18	1.91	35	14.79	2.25	-2.61(-3.59, -1.63)
Takada R (2018)[86]	30	10.50	1.30	30	10.30	1.10	0.20(-0.41, 0.81)
Li SL (2019)[67]	25	10.3	1.75	25	10.3	1.75	0.00 (-0.97, 0.97)
Pool mean difference							-1.27 (-2.22, -0.33)
	DSA/SuperPath			PA			
Xie J (2017)[93]	46	7.40	1.06	46	14.50	2.38	-7.10 (-7.85, -6.35)
Hongmou Y (2018) [64]	40	7.50	1.13	44	10.73	1.3	-3.23 (-3.75, -2.71)
Ouyang C (2018)[78]	12	10.40	3.00	12	12.50	1.40	-2.10 (-3.97, -0.23)
Meng W (2019)[73]	4	7.62	0.97	4	11.12	1.21	-3.50 (-5.02, -1.98)
Meng W (2021)[19]	20	7.83	1.12	20	12.45	1.71	-4.62 (-5.52, -3.72)
Li X (2021)[68]	49	6.88	0.54	47	11.91	1.22	-5.03 (-5.40, -4.66)
Pool mean difference							-4.38 (-5.61, -3.16)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

G) Efficacy of interventions on operative blood loss (cc)

Author (Year)	**No. patient**	**Mean**	**SD**	**No. patient**	**Mean**	**SD**	**Mean difference (95%CI)**
	DAA			PA			
Barrett WP (2013)[53]	43	391.00	206.00	44	191.00	107.00	200.00(130.79,269.21)
Lou Z (2016) [69]	52	59.40	10.20	52	83.70	14.10	-24.30(-29.03, -19.57)
Zhao HY (2017)[96]	60	165.89	42.60	60	123.84	56.83	42.05(24.08, 60.02)
Rykov K (2017)[85]	23	325.70	99.74	23	273.70	181.00	52.00(-32.46, 136.46)
Xu J (2017)[94]	45	229.60	79.20	42	215.70	56.00	13.90(-14.78, 42.58)
Rykov K (2021)[84]	23	340.10	135.30	23	245.20	259.90	94.90 (-24.85, 214.65)
Pool mean difference							52.02 (3.77, 100.27)
	LA			PA			
Yang C (2010)[95]	55	376.18	168.30	55	605.00	225.12	-228.82(-303.10,-154.54)
Goosen JHM (2011)[63]	30	532.00	279.00	30	452.00	163.00	80.00(-35.63, 195.63)
Wang T (2019)[91]	32	194.64	69.84	32	186.54	68.64	8.10 (-25.83, 42.03)
Pool mean difference							-49.49 (-219.60, 120.62)
	DAA			LA			
Mayr E (2009)[71]	16	282.00	2991.00	17	395.00	1752.08	-113(-1798.69,1572.69)
Restrepo C (2010)[82]	50	59.46	97.05	50	61.44	184.00	-1.98(-59.64, 55.68)
Dienstknecht T (2014) [61]	55	313.70	172.20	88	390.77	598.90	-77.00(-210.15, 56.15)
Parvizi J (2016) [79]	44	304.50	27430.0	40	303.70	10495.0	0.80(-8732.32,8733.92)
Brismar B (2018)[55]	50	337.50	2604.17	50	325.00	598.90	12.50(-911.89, 936.89)
Li SL (2019)[67]	25	210.00	135.00	25	230.00	145.00	-20.00 (-97.66, 57.66)
Pool mean difference							-13.55 (-58.00, 30.91)

	DSA/SuperPath			PA			
Xie J (2017)[93]	46	303.60	106.30	46	326.40	127.20	-22.80 (-70.70, 25.10)
Hongmou Y (2018) [64]	40	175	11.32	44	209.09	16.96	-34.09 (-40.32, -27.86)
Ouyang C (2018)[78]	12	138.33	42.82	12	141.67	35.89	-3.34 (-34.95, 28.27)
Meng W (2019)[73]	4	1108.50	163.63	4	843.50	111.60	265.00 (70.90, 459.10)
Meng W (2021)[19]	20	1007.38	174.22	20	844.55	161.16	162.83 (58.82, 266.84)
Li X (2021)[68]	49	204.99	60.29	47	343.61	88.61	-138.62(-168.83,-108.41)
Ulivi M (2021)[18]	22	149.00	66.00	23	225.00	125.00	-76.00 (-134.80, -17.20)
Pool mean difference							-17.54 (-66.09, 31.01)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

H) Efficacy of interventions on nerve injury

Author (Year)	No. patient	No. event	No. patient	No. event	RR (95%CI)
	DAA		PA		
Cheng TE (2017) [57]	35	29	37	0	62.28(3.95, 981.79)
Bon G (2019)[54]	50	8	50	0	17.00(1.01,286.82)
Cao J (2020)[56]	65	3	65	0	7.00 (0.37, 132.87)
Rykov K (2021)[84]	23	1	23	0	3.00 (0.13, 70.02)
Pooled RR					13.57 (3.17, 58.10)
	LA		PA		
Witzleb WC (2009)[92]	30	0	30	0	1.00 (0.02, 48.82)
Meneghimi RM (2009)[72]	8	0	8	0	1.00 (0.02, 45.13)
Yang C (2010)[95]	55	0	55	0	1.00 (0.02, 49.52)
Goosen JHM (2011)[63]	30	0	30	0	1.00 (0.02, 48.82)
Vicente JR (2014)[90]	121	5	103	0	9.38 (0.52, 167.58)
Pooled RR					2.00 (0.40, 10.00)
	DAA		LA		
Restrepo C (2010)[82]	50	0	50	0	1.00(0.02, 49.42)
Dienstknecht T (2014) [61]	55	0	88	0	1.59(0.03, 78.96)
Nistor DV (2017)[77]	35	2	35	0	5.00(0.25, 100.53)
Takada R (2018)[86]	30	7	30	0	15.00(0.89, 251.42)
Reichert J (2018)[81]	77	3	71	1	2.77(0.29,25.99)
Senlei (2019)[67]	25	0	25	2	0.20 (0.01, 3.97)
Nistor DV (2020)[76]	56	3	56	0	7.00 (0.37, 132.46)
Pooled RR					2.73 (0.89, 8.37)
	LMIS		LA		
Pospischill M (2010)[80]	36	0	39	2	0.33 (0.01, 7.72)
Martin R (2011)[70]	42	0	41	0	0.98 (0.02, 48.10)
Landgraeber S (2013)[66]	20	0	20	1	0.22 (0.01, 4.36)

Pooled RR			0.36 (0.05, 2.41)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, RR = risk ratio

I) Efficacy of interventions on wound complication

Author (Year)	No. patient	No. event	No. patient	No. event	RR (95%CI)
	DAA		PA		
Barrett WP (2013)[53]	43	1	44	0	3.07(0.13, 73.30)
Taunton MJ (2014)[87]	27	0	27	1	0.33(0.01, 7.82)
Cheng TE (2017) [57]	35	3	37	3	1.06(0.23, 4.89)
Zhao HY (2017)[96]	60	0	60	0	1.00(0.02, 49.58)
Taunton MJ (2018)[88]	52	2	49	1	1.88 (0.18, 20.13)
Bon G (2019)[54]	50	0	50	1	0.33(0.01, 7.99)
Moerenhout K (2019)[75]	28	1	27	0	2.90 (0.12, 68.15)
Cao J (2020)[56]	65	1	65	1	1.00 (0.06, 15.65)
Rykov K (2021)[84]	23	2	23	1	2.00 (0.19, 20.55)
Pooled RR					1.21 (0.52, 2.83)
	LA		PA		
Witzleb WC (2009)[92]	30	2	30	0	5.00(0.25, 99.95)
Meneghimi RM (2009)[72]	8	1	8	0	3.00 (0.14, 64.26)
Yang C (2010)[95]	55	0	55	0	1.00(0.02, 49.52)
Goosen JHM (2011)[63]	30	1	30	0	3.00(0.13, 70.83)
Vicente JR (2014)[90]	121	1	103	0	2.56 (0.11, 62.11)
Pooled RR					2.81 (0.67, 11.88)
	DAA		LA		
Nistor DV (2017)[77]	35	0	35	0	1.00 (0.02, 49.04)
Takada R (2018)[86]	30	0	30	0	1.00 (0.02, 48.82)
Brismar B (2018)[55]	50	1	50	1	1.00 (0.02, 15.55)
Zomar BO (2018)[97]	36	0	42	1	0.39 (0.02, 9.23)
Pooled RR					0.77 (0.15, 4.05)
	DSA/SuperPath		PA		
Xie J (2017)[93]	46	0	46	0	1.00 (0.02, 49.35)

Ouyang C (2018)[78]	12	0	12	0	1.00 (0.02, 46.70)
Meng W (2019)[73]	4	0	4	0	1.00 (0.02, 41.21)
Meng W (2021)[19]	20	0	20	0	1.00 (0.02, 48.09)
Pooled RR					1.00 (0.15, 6.79)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip, RR = risk ratio

J) Efficacy of interventions on visual analog scale (VAS) pain

Post-operative day 1							
Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			LA			
Dienstknecht T (2014) [61]	55	2.00	1.50	88	3.40	2.40	-1.40(-2.11, -0.69)
Mjaaland KE (2015) [74]	84	2.60	2.00	80	4.00	2.30	-1.40(-2.06, -0.74)
Nistor DV (2017) [77]	35	1.25	0.10	35	3.50	0.42	-2.25(-2.39, -2.11)
Brisma B (2018) [55]	50	3.67	0.67	50	4.08	0.67	-0.41(-0.67, -0.15)
Pool mean difference							-1.37(-2.51, -0.22)
	DSA/SuperPath			PA			
Ouyang C (2018) [78]	12	3.50	0.80	12	4.17	0.72	-0.67 (-1.28, -0.06)
Meng W (2019) [73]	4	8.25	0.95	4	7.00	0.81	1.25 (0.03, 2.47)
Meng W (2021) [19]	20	7.38	0.77	20	6.94	0.72	0.44 (-0.02, 0.90)
Pool mean difference							0.24 (-0.72, 1.21)
Post-operative day 2							
Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			LA			
Dienstknecht T (2014) [61]	55	2.00	1.90	88	3.00	2.10	-1.00(-1.73, -0.47)
Mjaaland KE (2015) [74]	84	1.90	1.80	80	3.00	2.30	-1.10(-1.73, -0.47)
Nistor DV (2017) [77]	35	0.75	0.02	35	2.75	0.10	-2.00(-2.03, -1.97)
Brisma B (2018) [55]	50	1.83	0.46	50	2.67	0.46	-0.84(-1.02, -0.66)
Pool mean difference							-1.25(-2.06, -0.44)
Post-operative day 3							
Author (Year)	No. patient	Mean	SD	No. patient	Mean	SD	Mean difference (95%CI)
	DAA			LA			

Dienstknecht T (2014) [61]	55	1.80	1.60	88	2.70	2.00	-0.90(-1.53, -0.27)
Mjaaland KE (2015) [74]	84	1.60	1.70	80	2.80	2.10	-1.20(-1.78, -0.62)
Nistor DV (2017) [77]	35	1.75	0.10	35	2.00	0.08	-0.25(-0.29, -0.21)
Brisma B (2018) [55]	50	1.83	0.46	50	2.17	0.46	-0.34(-0.52, -0.16)
Pool mean difference							-0.49(-0.76, -0.23)
	DSA/SuperPath			PA			
Ouyang C (2018) [78]	12	2.17	0.72	12	2.92	0.90	-0.75 (-1.40, -0.10)
Meng W (2019) [73]	4	7.00	1.41	4	6.50	0.57	0.50 (-0.99, 1.99)
Meng W (2021) [19]	20	7.05	0.72	20	6.55	0.70	0.50 (0.06, 0.94)
Pool mean difference							0.03 (-0.92, 0.99)

PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

Supplementary Table 5 Summary of results of direct meta-analysis

	No. studies	No. subjects	I2 (%)	Coefficient of Egger's test	S.E.	Egger's test (p-value)	Pooled RR/MD (95%CI)
Primary outcomes							
HHS ≤ 3months							
DAA vs PA	10	838	86.81	0.33	0.58	0.105	2.79 (1.03, 4.55)
LA vs PA	4	212	96.21	-1.67	8.53	0.799	2.15 (-7.92, 12.23)
DAA vs LA	7	718	82.19	3.76	0.86	0.909	3.76 (1.67, 5.85)
2-incision vs PA	2	88	0.0	-1.12	-	-	0.21(-4.69, 5.11)
DSA/SuperPath vs PA	6	344	96.39	1.73	3.16	0.613	1.80 (-2.05, 5.66)
HHS at 6 months							
DAA vs PA	6	534	0.00	0.09	0.32	0.982	-0.08 (-0.52, 0.36)
LA vs PA	2	212	0.0	0.55	-	-	1.36 (-0.34, 3.07)
DAA vs LA	3	298	23.47	1.08	7.20	0.842	2.84 (0.56, 5.13)
DSA/SuperPath vs PA	5	252	0.00	-0.38	0.30	0.289	0.56 (-0.27, 1.38)
HHS at 1 year							
DAA vs PA	5	297	0.00	1.99	0.51	0.614	1.78 (1.13, 2.42)
LA vs PA	2	76	0.00	0.04	-	-	-0.01 (-5.06, 5.05)
DAA vs LA	4	447	0.00	0.86	0.22	0.297	1.14 (0.15, 2.13)
2-incision vs PA	2	88	0.00	-2.31	-	-	-1.96 (-4.98, 1.07)

DSA/SuperPath vs PA	5	260	0.00	1.13	0.12	0.006	0.42 (-0.28, 1.12)
Dislocation							
DAA vs PA	6	536	0.00	-0.03	0.30	0.682	0.87 (0.49, 1.55)
LA vs PA	6	731	0.00	3.22	5.39	0.602	1.20 (0.31, 4.67)
DAA vs LA	4	378	0.00	3.01	6.44	0.702	1.20 (0.02, 49.04)
DSA/SuperPath vs PA	5	281	0.00	1.24	6.67	0.890	1.28 (0.29, 5.57)
Intra-operative fracture							
DAA vs PA	7	665	0.00	-5.79	6.28	0.439	0.59 (0.18, 1.98)
LA vs PA	6	666	0.00	1.47	2.27	0.762	2.10 (0.62, 7.13)
DAA vs LA	6	563	0.00	-1.61	1.56	0.311	1.18 (0.34, 4.02)
2-incision vs PA	2	88	0.0	6.30	-	-	1.85(0.16, 21.04)
LMIS vs LA	3	198	0.00	6.44	0.06	0.007	1.65 (0.21, 13.12)
DSA/SuperPath vs PA	5	209	0.00	5.97	0.56	0.002	1.75 (0.37, 8.35)

RR = risk ratio, MD = mean difference, HHS = Harris Hip Score, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

Supplementary Table 5 Summary of results of direct meta-analysis (continued)

	No. studies	No. subjects	I2	Coefficient of Egger's test	S.E.	Egger's test (p-value)	Pooled RR/MD (95%CI)
Secondary outcomes							
Operative time							
DAA vs PA	10	847	96.57	22.72	6.53	0.516	17.17 (10.91, 23.42)
LA vs PA	4	430	88.54	2.46	14.19	0.810	7.56 (-4.29, 19.41)
DAA vs LA	10	903	93.83	4.42	2.95	0.987	2.43 (-5.80, 10.67)
DSA/SuperPath vs PA	7	389	97.50	5.51	3.91	0.218	18.55 (4.84, 32.27)
Length of hospital stay							
DAA vs PA	10	808	53.48	-0.54	0.09	0.261	-0.39 (-0.57, -0.21)
DAA vs LA	5	505	98.71	-0.80	0.24	0.831	-0.57 (-1.02, -0.11)
2-incision vs PA	2	88	0.0	-0.05	-	-	-0.11(-0.28, 0.06)
DSA/SuperPath vs PA	5	260	96.03	1.21	0.77	0.156	-1.23 (-2.64, 0.18)
Incision length							
DAA vs PA	5	496	99.58	-4.70	1.61	0.369	-2.20 (-4.21, -0.19)
DAA vs LA	6	522	96.18	0.05	0.53	0.242	-1.27 (-2.22, -0.33)
DSA/SuperPath vs PA	6	344	93.91	1.35	3.85	0.744	-4.38 (-5.61, -3.16)
Operative blood loss							
DAA vs PA	6	490	94.95	-32.57	8.33	0.046	52.02 (3.77, 100.27)

LA vs PA	3	234	94.40	35.82	185.47	0.774	-49.49 (-219.60, 120.62)
DAA vs LA	6	510	0.00	-6.22	12.88	0.458	-13.55 (-58.00, 30.91)
DSA/SuperPath vs PA	7	389	91.91	0.50	1.84	0.797	-17.54 (-66.09, 31.01)
Nerve injury							
DAA vs PA	4	348	0.00	23.79	5.35	0.058	13.57 (3.17, 58.10)
LA vs PA	5	470	0.00	8.73	0.31	0.000	2.00 (0.40, 10.00)
DAA vs LA	7	683	0.00	2.78	3.19	0.595	2.73 (0.89, 8.37)
LMIS vs LA	3	198	0.00	-6.30	0.84	0.100	0.36 (0.05, 2.41)
Wound complication							
DAA vs PA	9	765	0.00	0.35	0.87	0.857	1.21 (0.52, 2.83)
LA vs PA	5	470	0.00	5.98	1.15	0.023	2.81 (0.67, 11.88)
DAA vs LA	4	308	0.00	-0.63	1.99	0.869	0.77 (0.15, 4.05)
DSA/SuperPath vs PA	4	164	0.00	-	-	-	1.00 (0.15, 6.79)
VAS pain POD1							
DAA vs PA	2	207	0.00	-1.22	-	-	-0.65(-0.91, -0.38)
DAA vs LA	4	477	97.98	-2.36	0.85	0.512	-1.37 (-2.51, -0.69)
DSA/SuperPath vs PA	3	72	82.73	-0.28	1.75	0.843	0.24 (-0.72, 1.21)
VAS pain POD2							
DAA vs PA	2	207	87.5	-1.38	-	-	-0.67(-1.34, -0.01)
DAA vs LA	4	477	98.22	-0.46	0.19	0.361	-1.25 (-2.06, -0.44)

VAS pain POD3							
DAA vs LA	4	477	79.93	-0.19	0.03	0.058	-0.49 (-0.76, -0.23)
DSA/SuperPath vs PA	3	72	79.89	0.44	1.38	0.848	0.03 (-0.92, 0.99)

RR = risk ratio, MD = mean difference, VAS = visual analog scale, POD = post-operative day, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip

Supplementary Table 6 Summary of results of heterogeneity exploration

Intervention	No.study all	I square	Variable	No.study with covariate	I square with covariate	Subgroup/Sensitivity analysis
HHS 12 wk						
2.LA vs 1.PA	4	96.21	BMI	4	26.56	69.91
	4	96.21	Age	4	94.26	
	3	91.04	%Male	3	84.91	
			%OA	2		
			ASA	0		
3.DAA vs 1.PA	10	86.81	W/O covariate			
	8	88.95	Age	8	90.4	
	7	89.9	BMI	7	90.23	
			ASA	1		
	4	87.28	%Male	4	71.64	
			%OA	2		
6.DSA/SuperPath vs 1.PA	5	95.66	Age	5	93.19	
	5	95.66	BMI	5	87.53	
			ASA	1		
			%Male	0		
			%OA	0		

3.DAA vs 2.LA	7	82.19	W/O covariate			
	6	85.03	Age	6	58.2	
	6	85.03	BMI	6	71.46	
	3	52.91	ASA	3	0	Not enough to analyze
	4	67.88	%Male	4	0	Not enough to analyze
	4	83.67	%OA	4	0	0
Operative time						
2.LA vs 1.PA	4	88.54	Age	4	82.39	
	4	88.54	BMI	4	91.85	
			ASA	0		
	3	90.63	%Male	3	0	Not enough to analyze
	3	90.63	%OA	3	92.86	
3.DAA vs 1.PA	10	96.57	W/O covariate			
	8	94.98	Age	8	90.07	
	7	95.58	BMI	7	95.26	
	3	84.44	ASA	3	37.51	Not enough to analyze
	4	95.83	%Male	4	75.79	
	3	84.37	%OA	3	82.63	
6.DSA/SuperPath vs 1.PA	6	93.93	Age	6	95.14	
	6	93.93	BMI	6	89.8	
			ASA	1		

			%Male	0		
			%OA	0		
3.DAA vs 2.LA	10	93.83	W/O covariate			
	8	95.2	Age	8	66.88	X = 60-68
	8	95.2	BMI	8	95.12	
	4	93.67	ASA	4	0	Not enough to analyze
	8	95.2	%Male	8	95.38	
	7	95.88	%OA	7	59.5	37.93
Operative blood loss						
2.LA vs 1.PA	3	94.4	Age	3	97.9	
	3	94.4	BMI	3	95.17	
			ASA	0		
			%Male	2		
			%OA	1		
3.DAA vs 1.PA	6	94.95	W/O covariate			
	4	87.82	Age	4	90.75	
	3	91.87	BMI	3	0	Not enough to analyze
			ASA	1		
			%Male	2		
			%OA	1		
6.DSA/SuperPath vs 1.PA	6	92.77	Age	6	83.45	

	6	92.77	BMI	6	93.83	
			ASA	1		
			%Male	0		
			%OA	0		
Length of hospital stay						
3.DAA vs 1.PA	10	53.48	W/O covariate			
	9	57.28	Age	9	34.49	57.23
	8	58.15	BMI	8	64.06	
	3	66.73	ASA	3	60.68	
	4	42.97	%Male	4	51.03	
	3	59.84	%OA	3	77.11	
6.DSA/SuperPath vs 1.PA	5	96.03	Age	5	96	
	5	96.03	BMI	5	96.92	
			ASA	1		
			%Male	0		
			%OA	0		
3.DAA vs 2.LA	5	98.71	W/O covariate			
	4	98.08	Age	4	93.59	
	4	98.08	BMI	4	86.24	
	3	73.15	ASA	3	0	Not enough to analyze

	3	73.15	%Male	3	0	Not enough to analyze
	3	98.44	%OA	3	0	Not enough to analyze
Incision length						
3.DAA vs 1.PA	5	99.58	W/O covariate			
	5	99.58	Age	5	99.3	
	4	99.52	BMI	4	99.61	
			ASA	1		
	3	95.69	%Male	3	97.84	
			%OA	1		
6.DSA/SuperPath vs 1.PA	5	90.52	Age	5	92.81	
	5	90.52	BMI	5	83.58	
			ASA	1		
			%Male	0		
			%OA	0		
3.DAA vs 2.LA	6	96.18	W/O covariate			
	5	96.92	Age	5	96.96	
	5	96.92	BMI	5	67.03	Drop No.23, 24
			ASA	2		
	5	96.92	%Male	5	97.11	
	4	96.35	%OA	4	96.35	
VAS						

Day 1						
6.DSA/SuperPath vs 1.PA	3	82.73	Age	3	90.07	
	3	82.73	BMI	3	85.67	
	1		ASA			
	0		%Male			
	0		%OA			
3.DAA vs 2.LA	4	97.98	W/O covariate			
	4	97.98	Age	4	94.2	
	4	97.98	BMI	4	95.09	
	3	83.98	ASA	3	64.64	Not enough to analyze
	4	97.98	%Male	4	95.55	
	4	97.98	%OA	4	81.77	
Day 2						
3.DAA vs 2.LA	4	74	W/O covariate			
	4	74	Age	4	59.41	
	4	74	BMI	4	69.72	
	3	0	ASA	3	0	
	4	74	%Male	4	56.54	
	4	74	%OA	4	60.56	
Day 3						

6.DSA/SuperPath vs 1.PA	3	79.89	Age	3	77.33	
	3	79.89	BMI	3	89.13	
	1		ASA	1		
	0		%Male	0		
	0		%OA	0		
3.DAA vs 2.LA	4	79.93	W/O covariate	4		
	4	79.93	Age	4	85.07	
	4	79.93	BMI	4	86.27	
	3	79.52	ASA	3	75.19	
	4	79.93	%Male	4	84.15	
	4	79.93	%OA	4	85.91	

HHS = Harris Hip Score, VAS = visual analog scale, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, 2-incision = 2 incisions approach, LMIS = Mini-lateral approach, DSA/SuperPath = Direct superior approach or Supercapsular percutaneously-assisted total hip, BMI = body mass index (kg/m2), ASA = The American Society of Anesthesiologists (ASA) Physical Status Classification System, OA = osteoarthritis, W/O = without

Supplementary Table 7 Inconsistency assumption assessment of network meta-analysis

Outcomes	Chi-square	P-value
Primary outcome		
HHS ≤ 3 months	0.72	0.87
HHS at 6 months	8.35	0.02
HHS at 1 year	0.11	0.99
Dislocation	0.19	0.66
Intra-operative fracture	2.08	0.56
Secondary outcome		
Operative time	0.76	0.38
Length of hospital stay	0.22	0.90
Incision length	2.76	0.10
Operative blood loss	1.99	0.16
Nerve injury	0.69	0.71
Wound complication	0.24	0.89
VAS day 1	6.97	0.01
VAS day 2	18.76	0.00
VAS day 3	5.35	0.02

HHS = Harris Hip Score, VAS = visual analog scale

Supplementary Figure1. Funnel and contour-enhanced funnel plots for direct meta-analysis

Supplementary Figure1.1 Funnel plots and contour-enhanced funnel plots of Harris Hip Score (HHS) at ≤ 3 months

Supplementary Figure1.2 Funnel plots of Harris Hip Score (HHS) at 6 months

Supplementary Figure1.3 Funnel of Harris Hip Score (HHS) at 1 year

Supplementary Figure1.4 Funnel plots of dislocation rate

Supplementary Figure1.5 Funnel plots of intra-operative fracture rate

Supplementary Figure1.6 Funnel and contour-enhanced funnel plots of operative time

Supplementary Figure1.7 Funnel and contour-enhanced funnel plots of length of hospital stay

Supplementary Figure1.8 Funnel and contour-enhanced funnel plots of incision length

Supplementary Figure1.9 Funnel and contour-enhanced funnel plots of operative blood loss

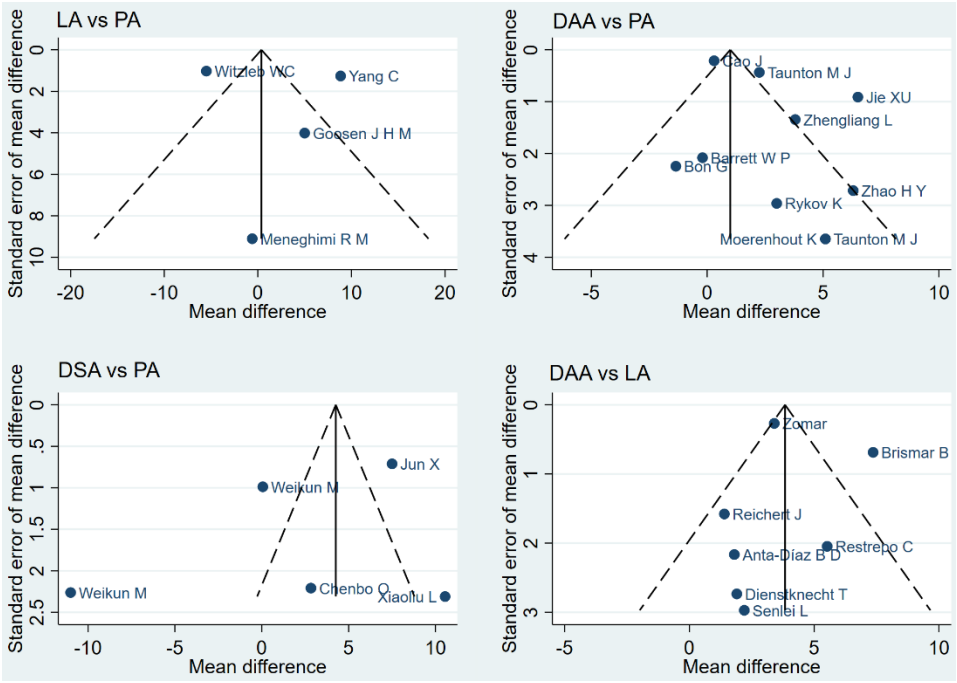
Supplementary Figure1.10 Funnel plots of nerve injury rate

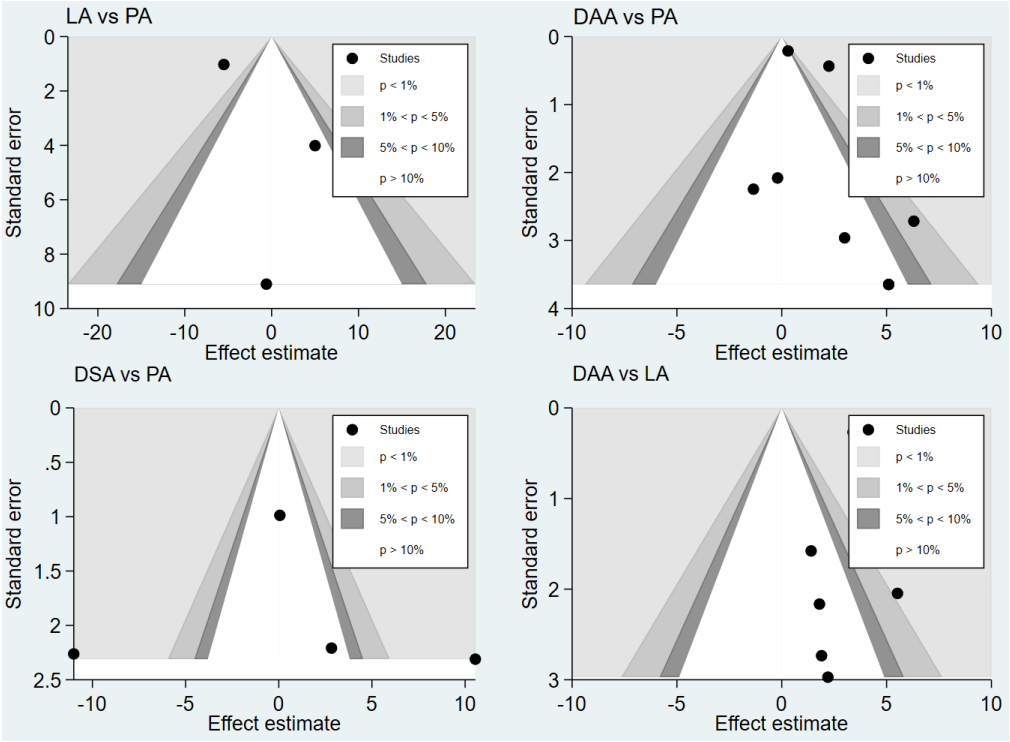
Supplementary Figure1.11 Funnel plots of wound complication rate

Supplementary Figure1.12 Funnel and contour-enhanced funnel plots of VAS pain at POD 1

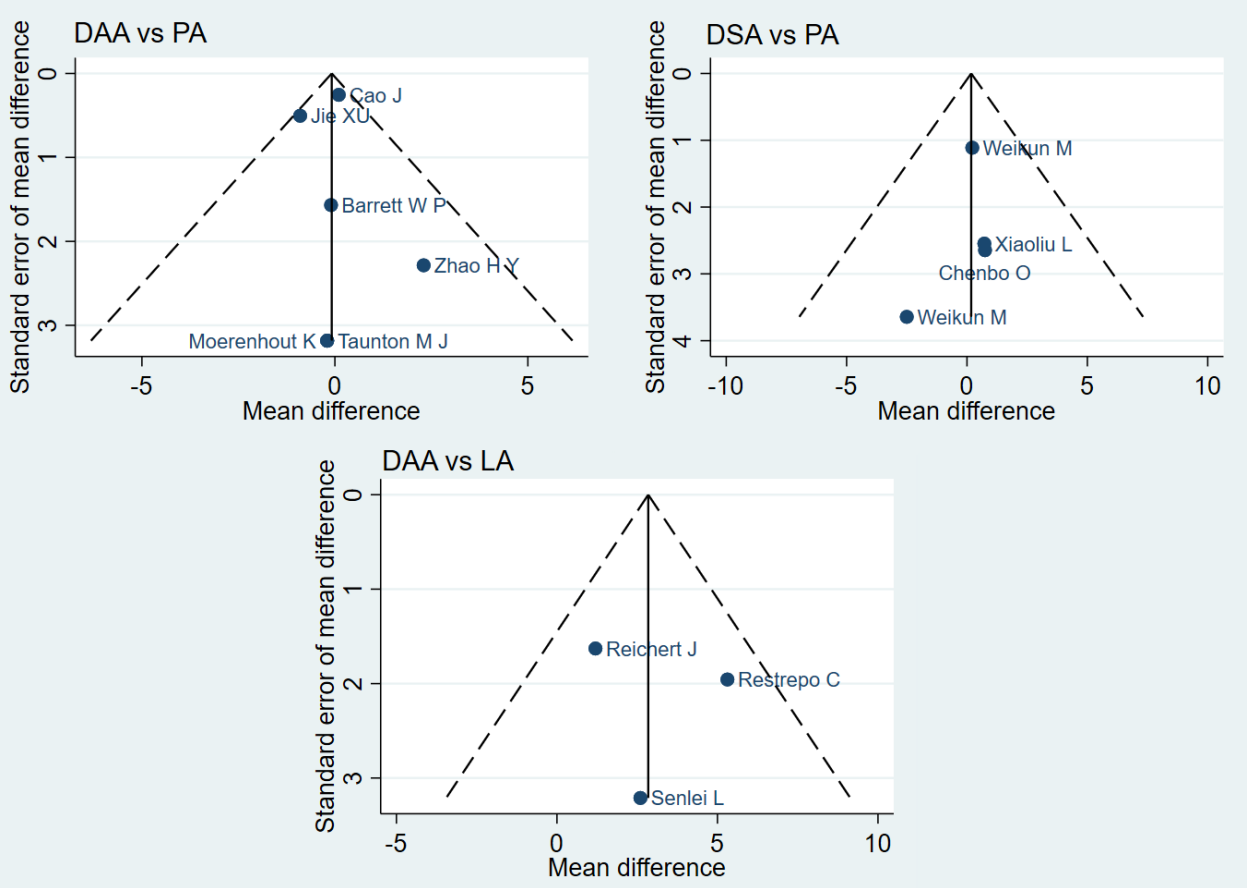
Supplementary Figure1.13 Funnel and contour-enhanced funnel plots of VAS pain at POD 2

Supplementary Figure1.14 Funnel and contour-enhanced funnel plots of VAS pain at POD 3

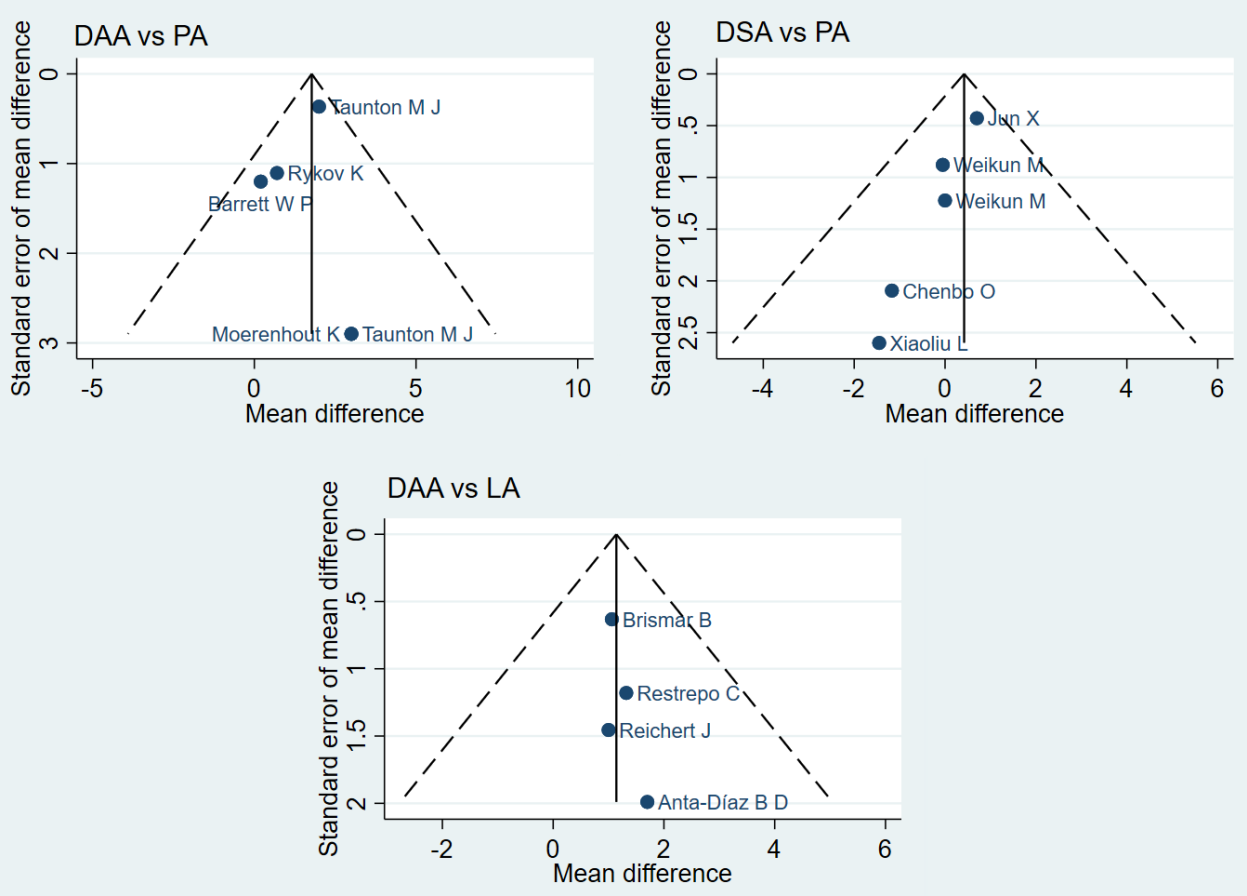

LA vs PA
Standard error of mean difference
Witzleb W C
Yang C
Goossen J H M
Meneghimi R M
Mean difference
DAA vs PA
Standard error of mean difference
Cao J
Taunton M J
Jie XU
Zhengliang L
Barrett W P
Bon G
Zhao H Y
Rykov K
Moerenhout K
Taunton M J
Mean difference
DSA vs PA
Standard error of mean difference
Jun X
Weikun M
Weikun M
Chenbo O
Xiaoliu L
Mean difference
DAA vs LA
Standard error of mean difference
Zomar
Brismar B
Reichert J
Restrepo C
Anta-Diaz B D
Diensknecht T
Senlei L
Mean difference


LA vs PA
Standard error
Studies
p < 1%
1% < p < 5%
5% < p < 10%
p > 10%
Effect estimate
DAA vs PA
Standard error
Studies
p < 1%
1% < p < 5%
5% < p < 10%
p > 10%
Effect estimate
DSA vs PA
Standard error
Studies
p < 1%
1% < p < 5%
5% < p < 10%
p > 10%
Effect estimate
DAA vs LA
Standard error
Studies
p < 1%
1% < p < 5%
5% < p < 10%
p > 10%
Effect estimate

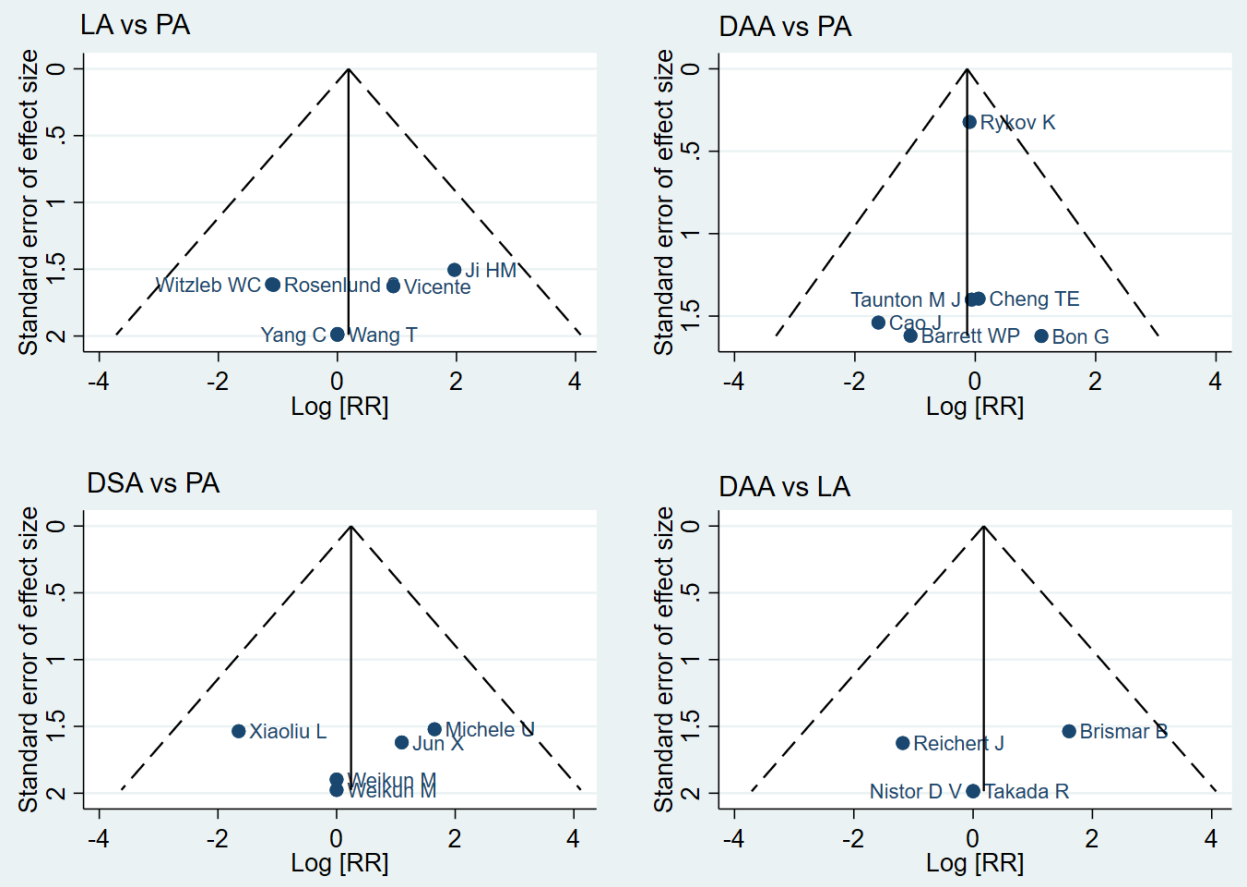
Supplementary Figure1.1 Funnel plots and contour-enhanced funnel plots of Harris Hip Score (HHS) at ≤ 3 months, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip



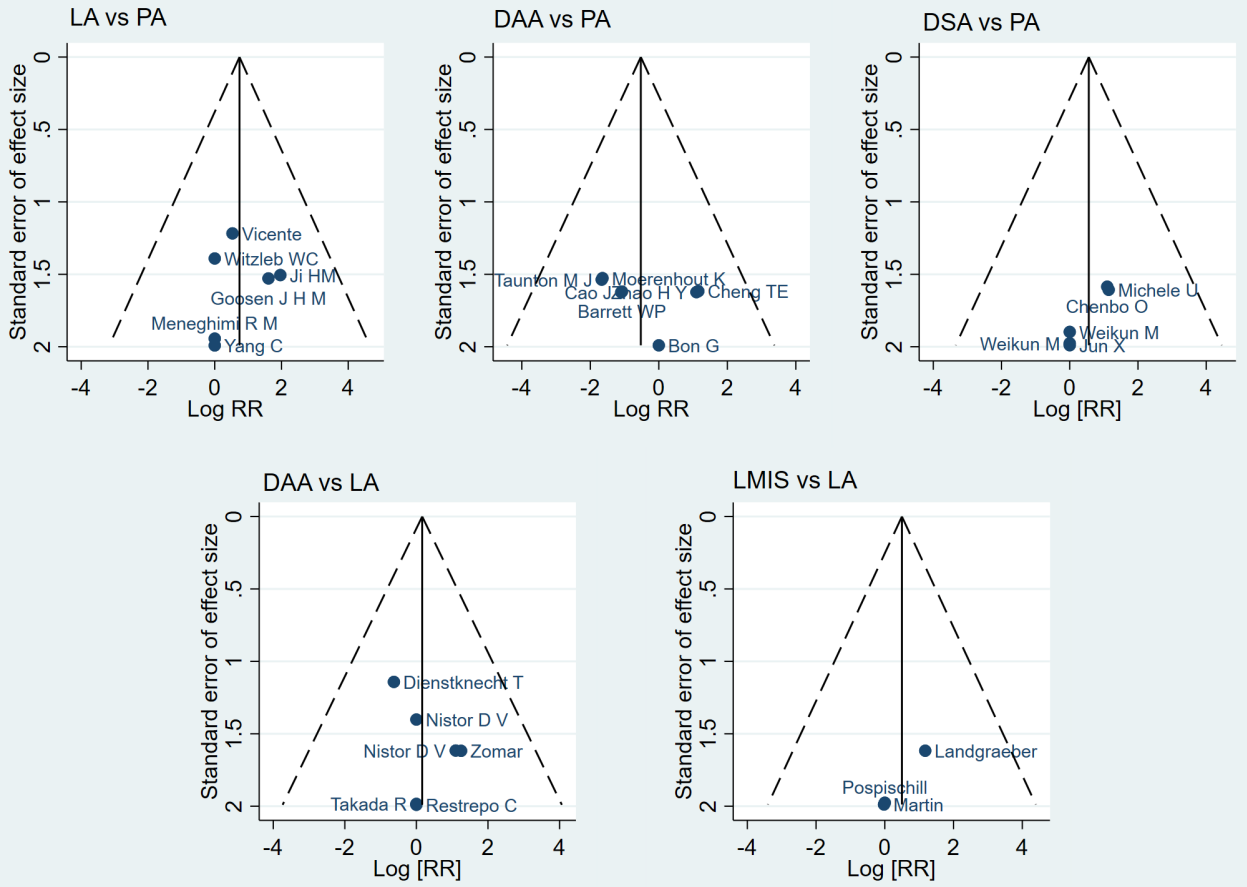
Supplementary Figure1.2 Funnel plots of Harris Hip Score (HHS) at 6 months, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip



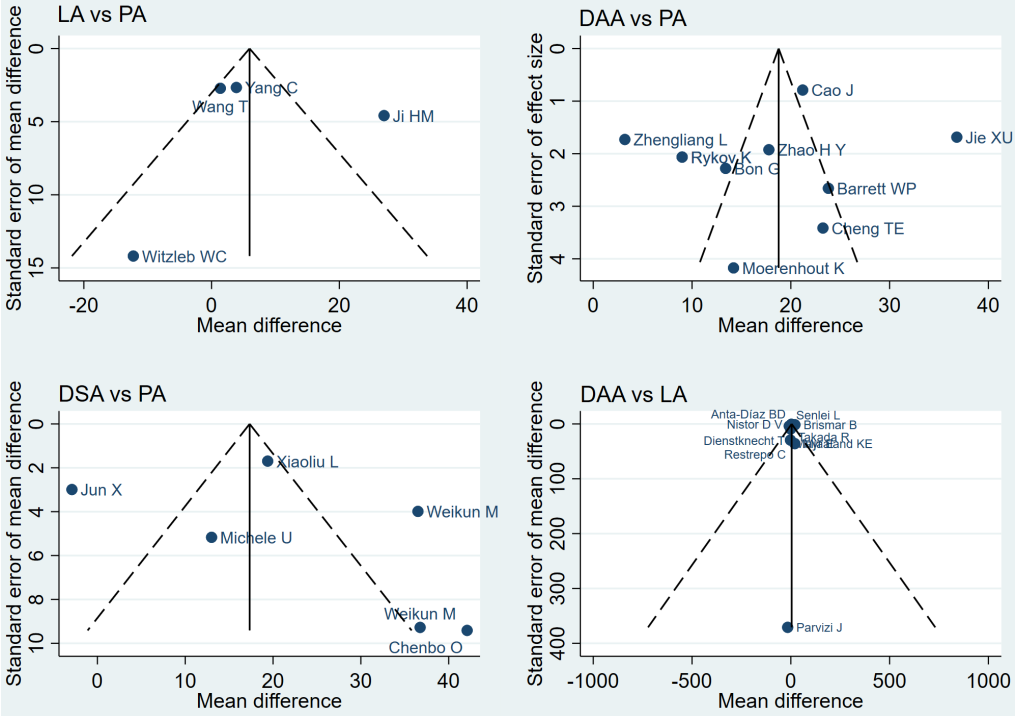
Supplementary Figure1.3 Funnel of Harris Hip Score (HHS) at 1 year, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip

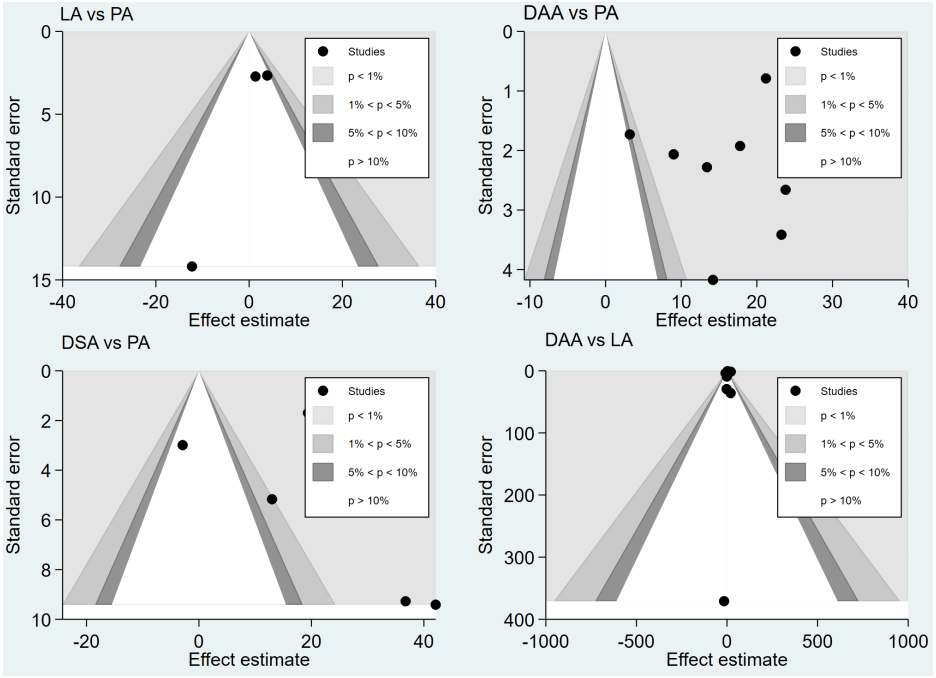


Supplementary Figure1.4 Funnel plots of dislocation rate, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip, RR = risk ratio



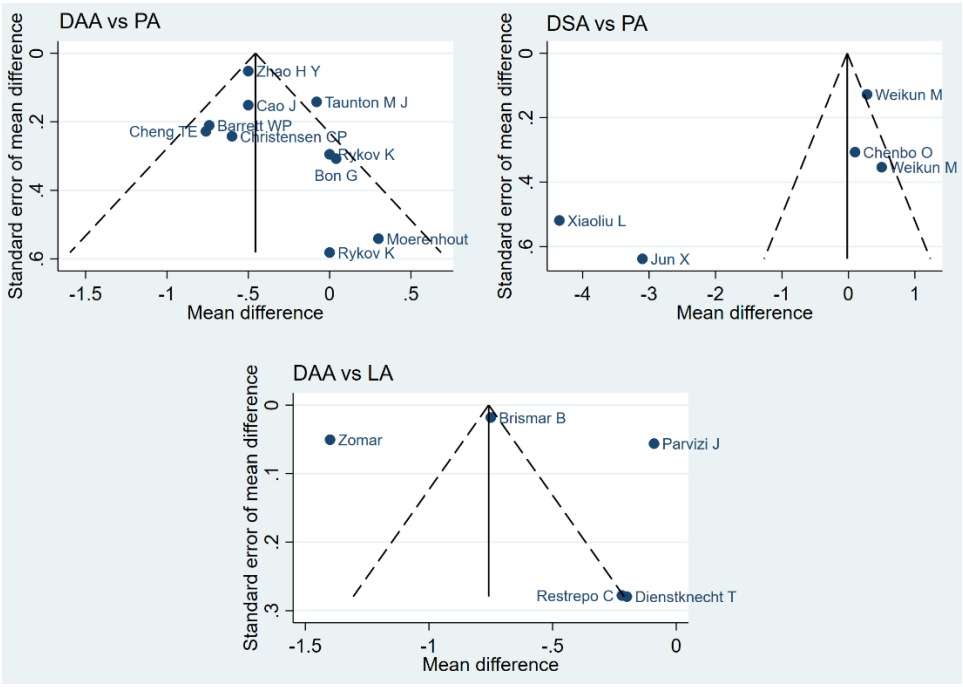
Supplementary Figure1.5 Funnel plots of intra-operative fracture rate, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, LMIS = Mini-lateral approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip, RR = risk ratio

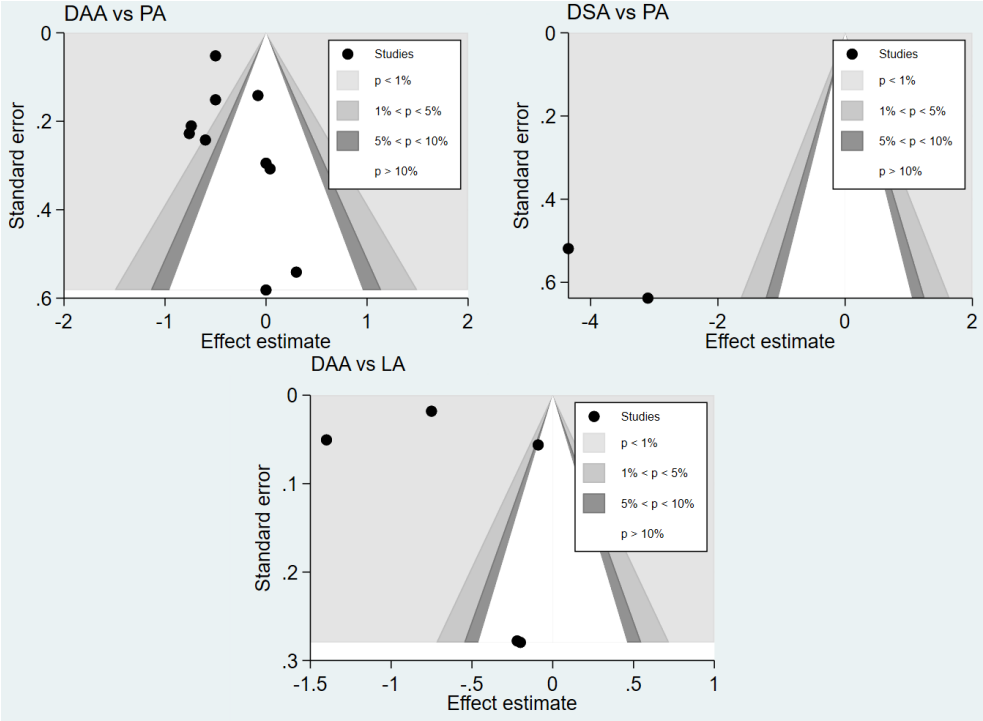




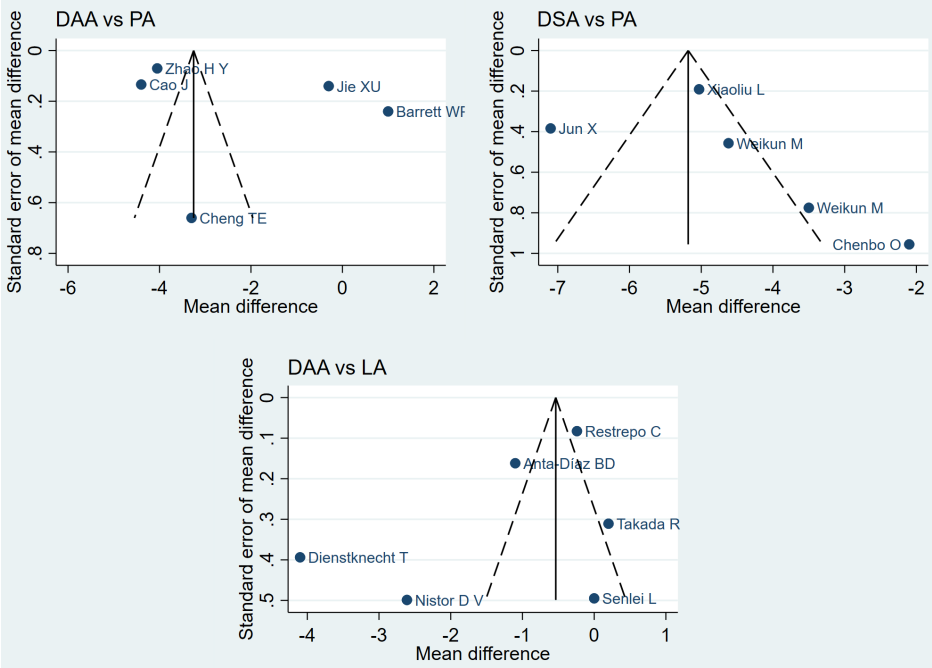
Supplementary Figure1.6 Funnel plots and contour-enhanced funnel plots of operative time, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach,

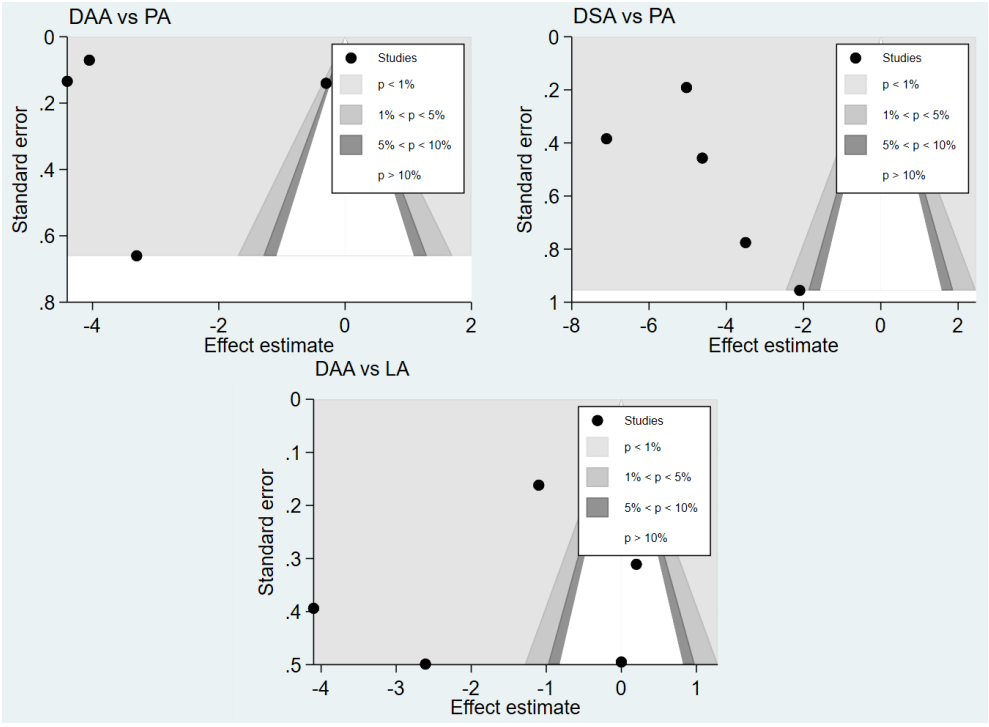
DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip



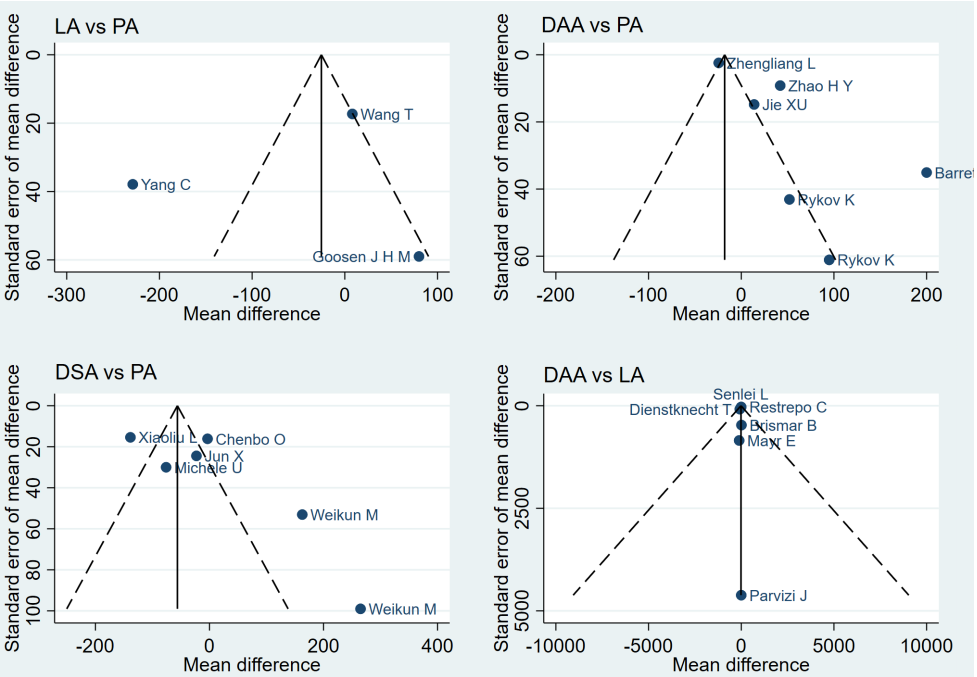


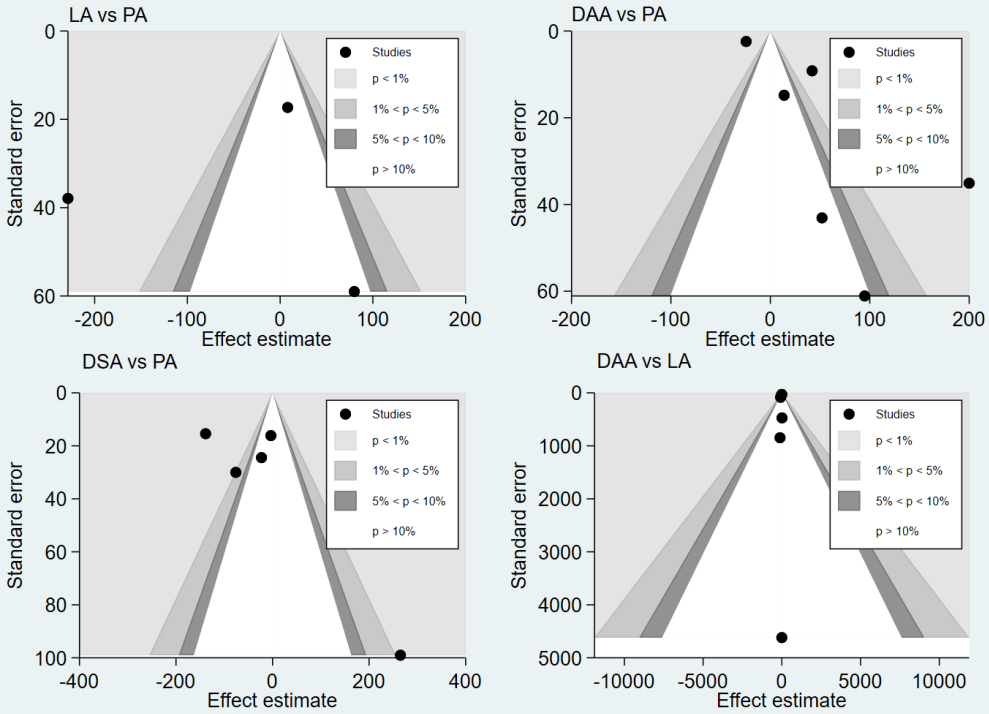
Supplementary Figure1.7 Funnel plots and contour-enhanced funnel plots of length of hospital stay, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip



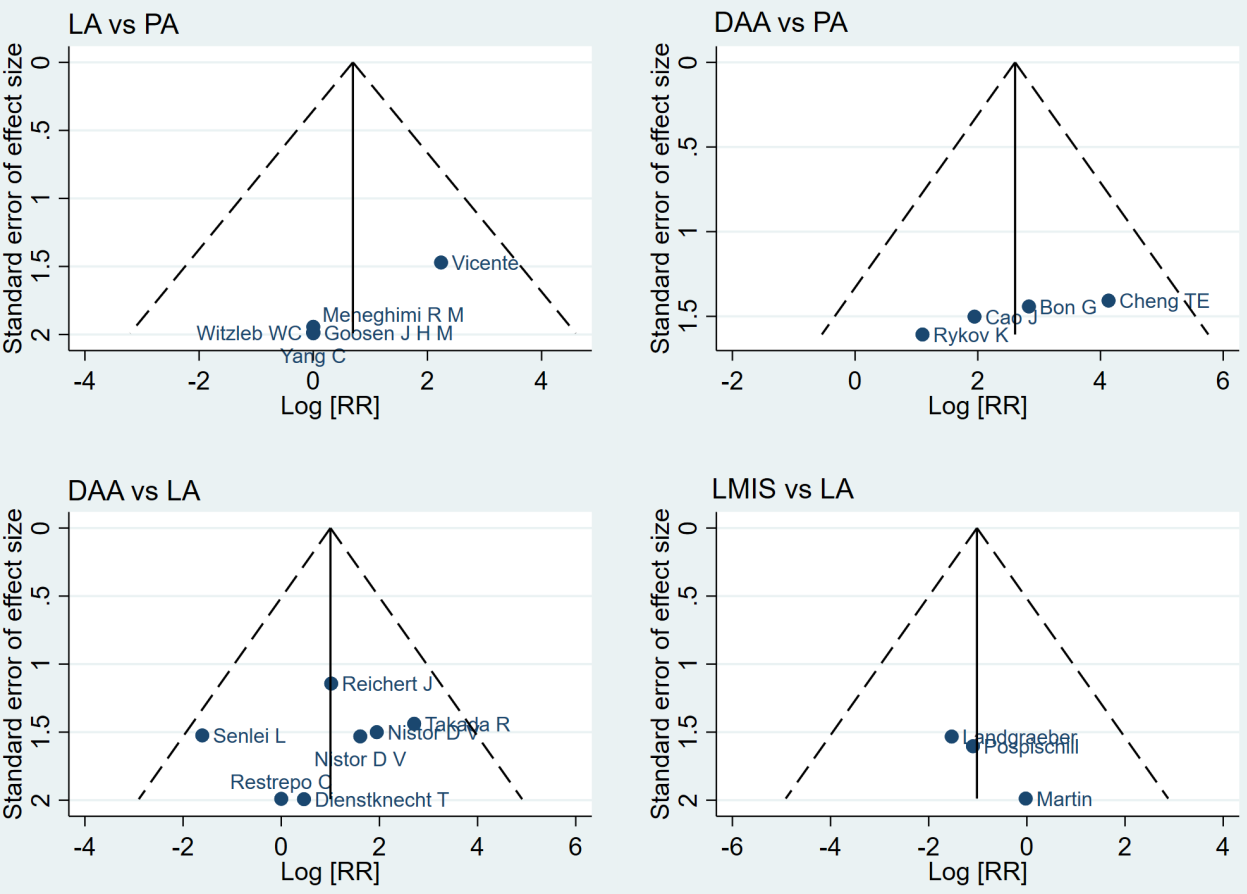


Supplementary Figure1.8 Funnel plots and contour-enhanced funnel plots of incision length, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip

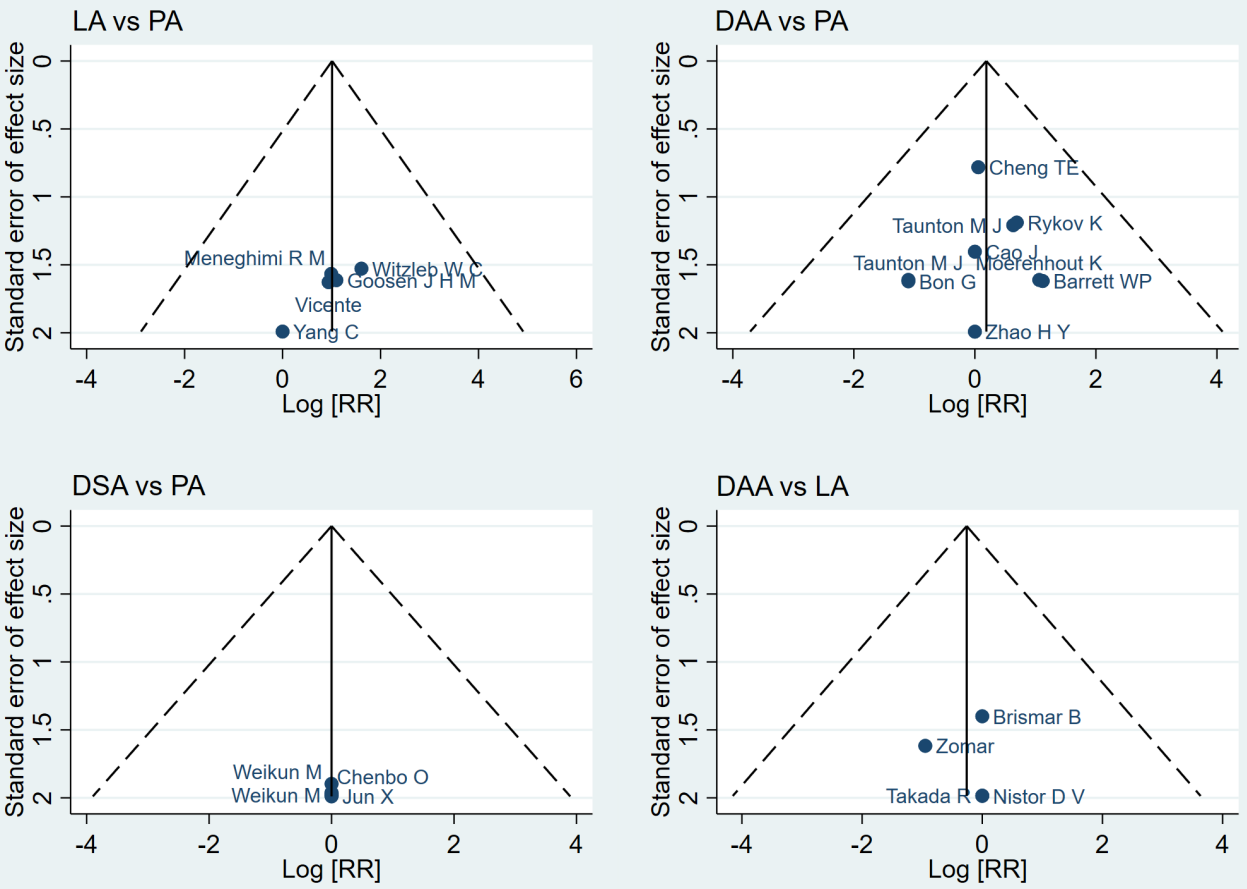




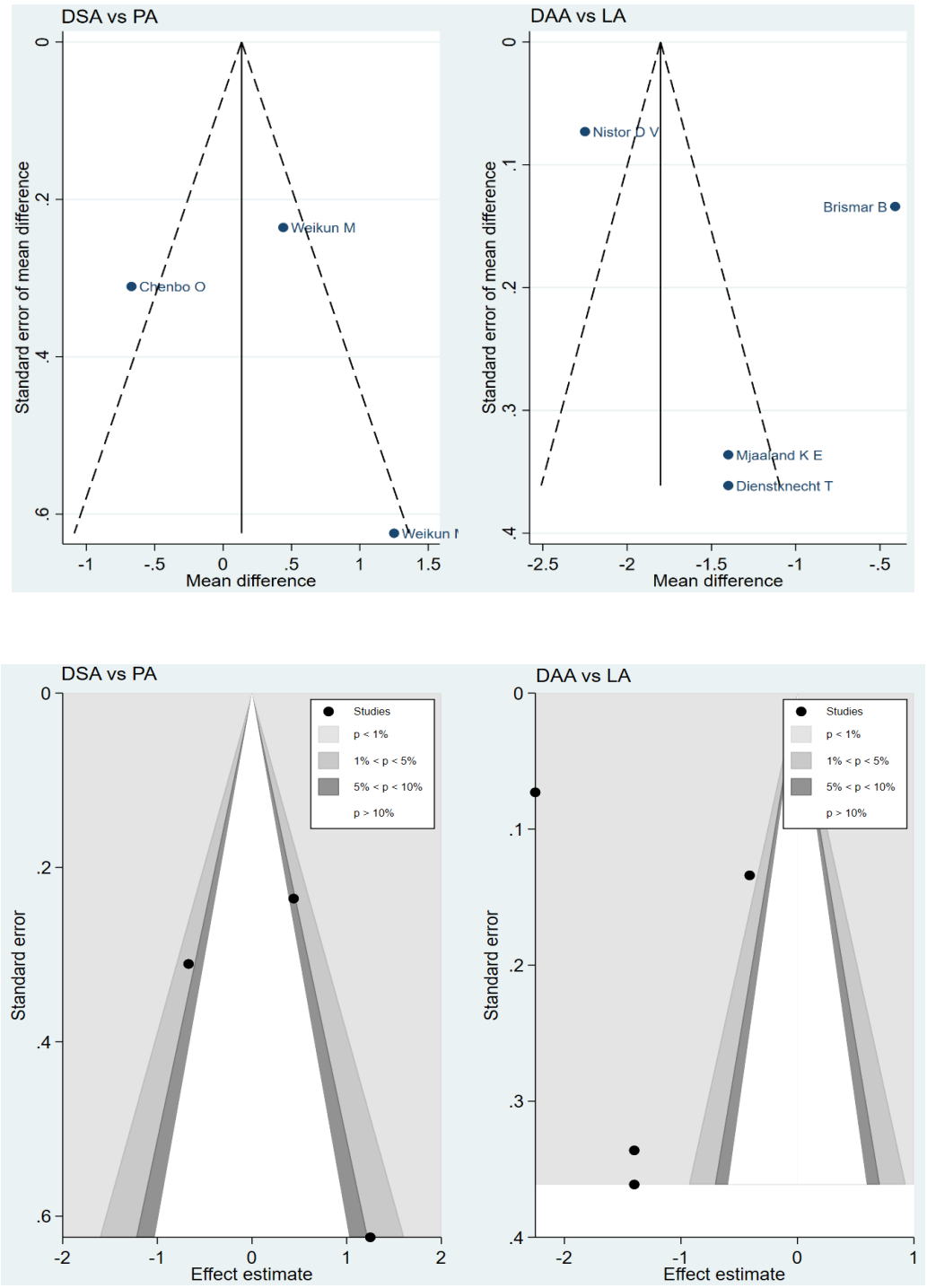
Supplementary Figure1.9 Funnel and contour-enhanced funnel plots of operative blood loss, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip



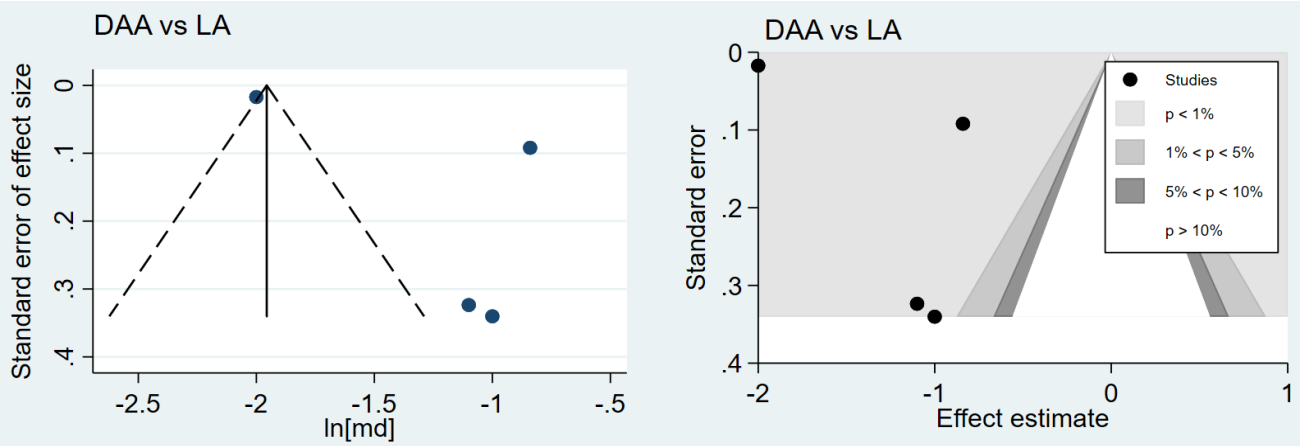
Supplementary Figure1.10 Funnel plots of nerve injury rate, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, LMIS = Mini-lateral approach, RR = risk ratio



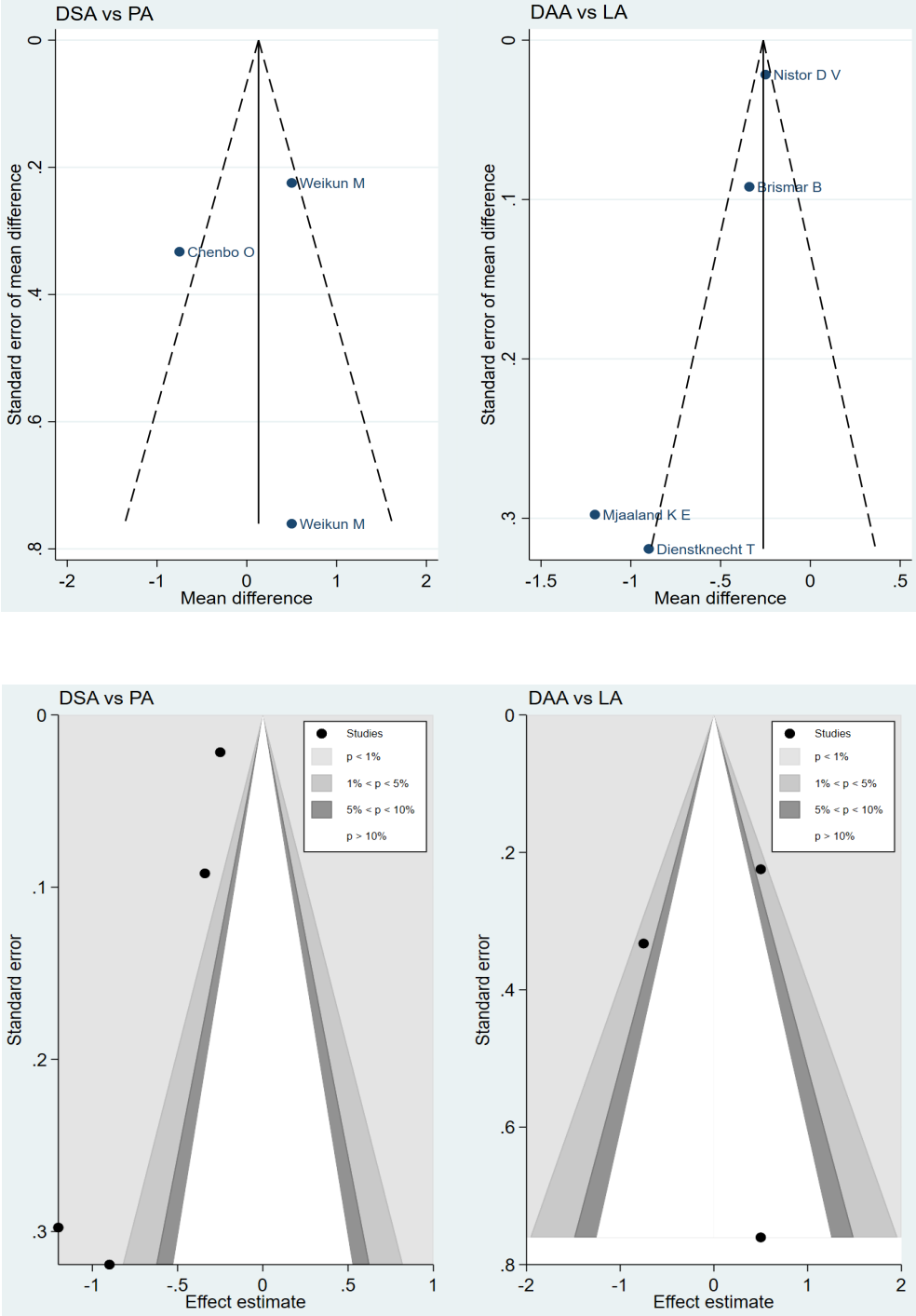
Supplementary Figure1.11 Funnel plots of wound complication rate, PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip, RR = risk ratio



Supplementary Figure1.12 Funnel plots and contour-enhanced funnel of visual analog scale (VAS) pain at post-operative day 1 (POD 1), PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip

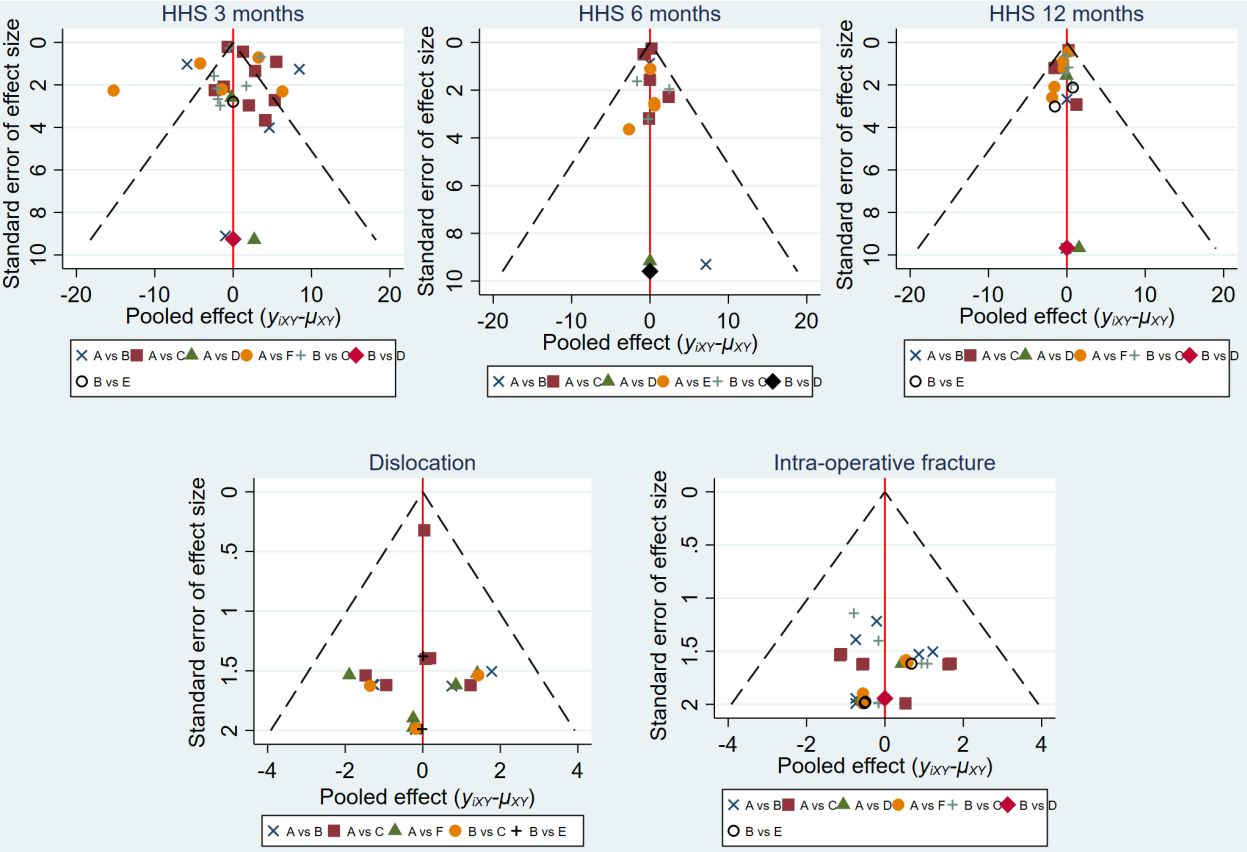


Supplementary Figure1.13 Funnel and contour-enhanced funnel plots of visual analog scale (VAS) pain at post-operative day 2 (POD 2), LA = Lateral approach, DAA = Direct anterior approach

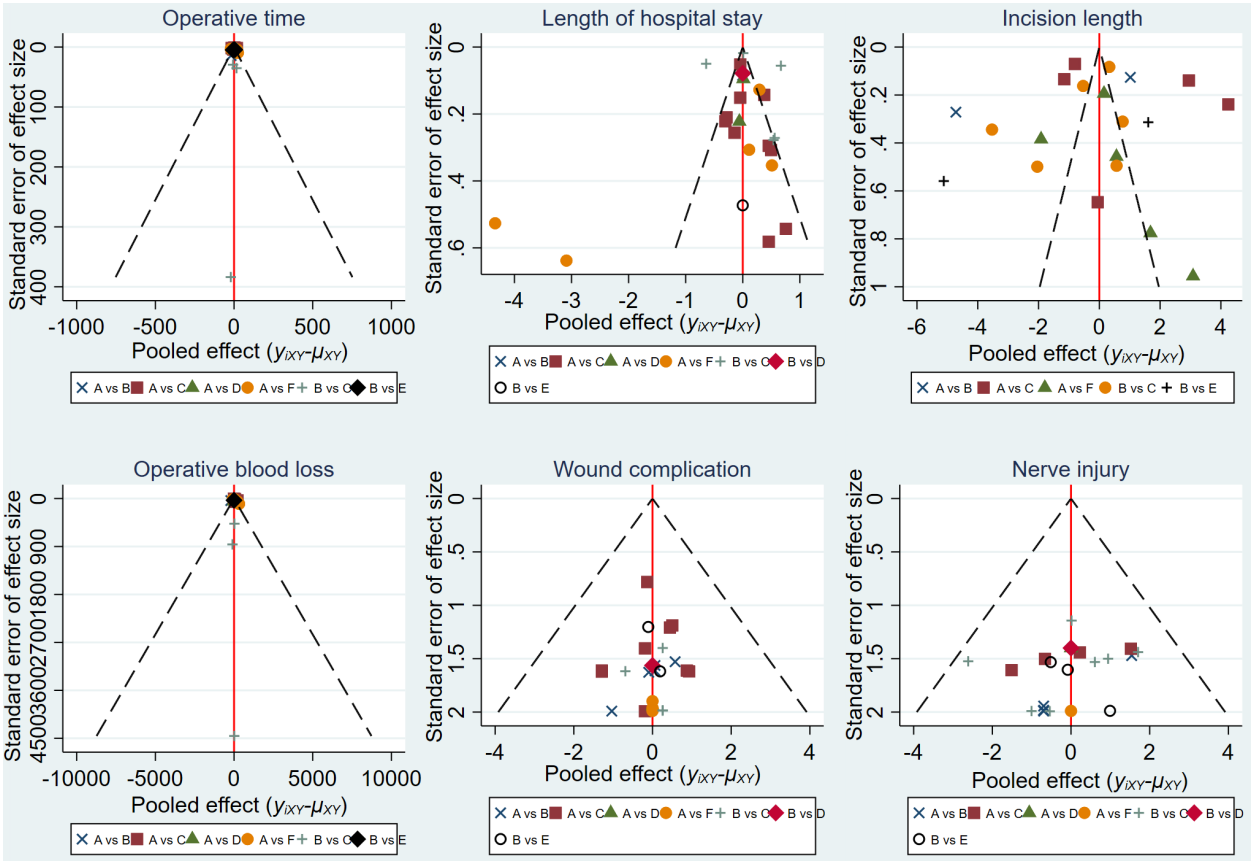


Supplementary Figure1.14 Funnel plots and contour-enhanced funnel of visual analog scale (VAS) pain at post-operative day 3 (POD 3), PA = Posterior approach, LA = Lateral approach, DAA = Direct anterior approach, DSA = Direct superior approach included Supercapsular percutaneously-assisted total hip

Supplementary Figure2 Comparison-adjusted funnel plots for network meta-analysis



Supplementary Figure2.1 Adjusted funnel plots for primary outcomes, HHS = Harris Hip Score



Supplementary Figure2.2 Adjusted funnel plots for secondary outcomes